

EUDEMUS OF RHODES

RUTGERS UNIVERSITY STUDIES IN
CLASSICAL HUMANITIES

VOLUME
XI

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ISTVÁN BODNÁR
WILLIAM W. FORTENBAUGH

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OF
RHODES

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Preface

This volume of Rutgers University Studies in Classical Humanities, no. XI in the series, is the third devoted to Theophrastus' colleagues, pupils and successors, i.e., those Peripatetic philosophers, whom Fritz Wehrli brought together under the label *die Schule des Aristoteles*. Volume IX focuses on Demetrius of Phalerum, who was Theophrastus' pupil and for ten years the ruler of Athens. Volume X has Dicaearchus of Messana, Theophrastus' fellow-pupil within the Aristotelian Peripatos, as its subject. The present Volume, no. XI, concentrates on Eudemus of Rhodes, who, like Dicaearchus, studied under Aristotle and alongside Theophrastus. This concern with *die Schule des Aristoteles* will continue with the next two volumes: Lyco of Troas and Hieronymus of Rhodes will be the subjects of Volume XII, and Aristo of Ceos will be featured in Volume XIII. All three belong to the post-Theophrastean Peripatos. Like Volumes IX and X, so Volumes XII and XIII will present the ancient sources with translation as well as discussion by various scholars. Volume XI is different in that it is entirely composed of articles which discuss Eudemus from differing points of view.

Many of the papers within this volume were originally presented at a conference on Eudemus held in Budapest, Hungary. The conference was long in the planning stage. Preliminary discussions began in 1993 and continued into 1995 when a firm decision was reached to make Eudemus the topic and Budapest the site of the 1997 biennial conference sponsored by Project Theophrastus. István Bodnár accepted responsibility for making arrangements in Budapest: he reserved rooms in the Guest House of the Eötvös University and booked the Faculty Hall of the University for meetings. Nevertheless his efforts would be undone by the Rector of the University. Six months before the meeting was scheduled to begin, all reservations were canceled to make room for a conference that the Rector decided to sponsor. That was a rude jolt, but not a knockout blow. Thanks to Mr. Csaba Szabó, Director of Inter-

national Programs at the Gáspár Károli University of the Hungarian Reformed Church, dormitory space and lecture rooms were made available at Károli University. We express our gratitude to Mr Szabó for making possible at short notice a fine conference in a delightful city. For financial and organizational assistance, we are grateful to the Hungarian Academy of Sciences, the Hungarian National Fund for Scientific Research, the Hungarian National Committee for Technical Development, the Division of History of Science of the International Union of History and Philosophy of Science, the Departmental Group of Philosophy and the Department of Symbolic Logic and Methodology of Science of the Eötvös University. For financial support we also wish to express our thanks to the Research Council of Rutgers University.

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Eudemus in the Arabic Tradition¹

Dimitri Gutas

I. Introduction

The information on Eudemus of Rhodes that can be recovered in Arabic sources falls into three categories: there is a full collection of sayings (Section II below and Appendix), some incidental biographical notices that mainly state his relation to Aristotle and Theophrastus (Section III), and a number of references to his views on logic which he held in common with Theophrastus (Section IV). No work of his is reported to have been translated into Arabic or is known to be extant. Apart from the sayings, therefore, Eudemus has no independent persona or presence in Arabic but rides on the coattails primarily of Theophrastus. This is hardly surprising, given the little information on Eudemus that was available even in Greek at the time of the rise of Islam.

¹ An initial draft of this paper was delivered at the Theophrastus Conference in Budapest, July 1997. I wish to thank the participants for a number of helpful comments and suggestions. I am also grateful to Franz Rosenthal for sharing with me, on this as on previous occasions, some of his insights and vast knowledge of matters gnomological.

What is surprising is the collection of sayings. It is found only in the major Arabic gnomologium known as the *Ṣiwān al-ḥikma* (*Depository of Wisdom Literature*), compiled around 1000 A.D. from material translated from Greek in the previous two centuries. As reconstructed below (see the edition in the Appendix and the translation in Section II), it contains 29 sayings,² though the original entry may have been longer. Even so, 29 sayings is a goodly number for a philosopher who survived so poorly in late antiquity and who was virtually unknown in Arabic. Now this collection is unique when viewed both from the Arabic and Greek side. That no other Arabic gnomologium has any section on Eudemus or even a saying attributed to him is quite remarkable, given that he is introduced in the *Ṣiwān* as a prominent student of Aristotle. On the Greek side, it is even more astonishing that, as far as I am aware, none of the very extensive Greek gnomologia has any sayings by Eudemus. The question of the sources of the *Ṣiwān* for the entry on Eudemus thus imposes itself.

Certain considerations limit the parameters within which the answer is to be sought. In the first place, the section on Eudemus in the *Ṣiwān* is so located as to make it certain beyond a reasonable doubt that the source was a Greek gnomologium. It comes right after the entries on Aristotle and Theophrastus, and it is followed by that on another, unidentified, philosopher (ʿshwlws), who is also said to have been a student of Aristotle and a close colleague of Theophrastus and Eudemus (see n. 22 below). There is thus absolutely no doubt that the Eudemus in this part of the *Ṣiwān* is indeed Eudemus of Rhodes and not another person whose name, in the complicated history of the transmission of these sayings within Greek, from Greek into Arabic, and within Arabic, was mistaken for or transformed into his.

Second, since Eudemus was almost completely unknown in Arabic, as already mentioned, there would have been no incentive to attribute to him forged sayings or sayings by others. Not only was he unknown in philosophy, but what is even more important when considering possible cases of pseudepigraphous literature in Arabic, he was unknown even in alchemical and magical literature, which contained a long list of names of famous Greeks, including Theophrastus, who allegedly wrote on alchemical and magical subjects. Thus the entry on Eudemus in the *Ṣiwān* cannot but ultimately be of Greek origin.

² Or possibly, in a conservative count, 27. See below in Section II, note to saying 28.

The compiler of the *Šiwān* may have been drawing here also, as in the preceding section on Theophrastus,³ upon different Greek sources in Arabic translation. This is partially substantiated by the disparate nature and contents of the sayings. There are sayings that are both *apophthegmata* and *chreiai* in form, as well as *homoiomata* (nos. 2, 4), and in one case (no. 9) we have what appears to be a double transmission of the same saying. There are sayings on the usual subjects of ignorance (nos. 2–3), the ethos theory of music (no. 8), death (nos. 11–12, 29), good fortune (nos. 15, 23), rulers (no. 28), etc. There is also, however, misogyny (nos. 9–10), a subject concerning which it is not clear whether it was prevalent outside Cynic circles and the ancient philosophers they idolized (like Socrates); and although Eudemus was not among them, it may be significant that two of the sayings by Eudemus (nos. 13 and 26) are also attributed to Socrates in the Arabic *gnomologia*. There are, furthermore, some relatively extensive didactic passages (nos. 5, 7, 14) which appear like quotations from longer works. The one from Herodotus (no. 5) could easily be ultimately derived from one of Eudemus' *Historiai*, in which he demonstrably included material from the ancient Near East.⁴ Finally, assuming the compiler to have worked from different sources, misattribution cannot be ruled out either: sayings under a different original name could have been mistaken or misread for those by Eudemus. None of this, however, can be established with any certainty; there is simply not enough evidence to help decide whether this selection from various sources was made by the compiler of the *Šiwān* himself or it had already been made by his source, a translated *gnomologium* which included this section on Eudemus.

The absence of Eudemus from any extant Greek *gnomologium* makes impossible even an educated guess about the Greek source of the *Šiwān*. One immediately thinks of the *Eudemian Ethics*, but there are no specific correspondences between any of the 29 sayings and Aristotle's work, despite the superficial overlap between some of the *topoi* of the sayings and the *Eudemian Ethics*—one would like to compare, for example, saying number 12 with 1229b34–1230a4, or number 19 with 1238a14–26. One would thus have to postulate one or more Greek *gnomologia* with some sayings attributed to Eudemus, which

³ See the discussion in Gutas (1985) 83.

⁴ Cf., e.g., the comments by Wehrli (1969) 119–20 on some of the sources of Eudemus for his astronomical information.

eventually found their way into Arabic. The origins of this gnomologium (or gnomologia), its transmission and disappearance in Greek, and the particulars of its reappearance in Arabic are problems that still need to be investigated.

II. Sayings by Eudemus from *The Depository of Wisdom Literature*

EUDEMUS. He was also one of Aristotle's students who taught his knowledge and philosophy and wrote books on the strength of Aristotle's works, in the manner of his composition, and in his tradition.

1. He was asked, "Why do you <never> refuse those who ask you?" "So that," he replied, "I will never have to ask anyone who may refuse me."⁵
2. He said: That which prevents a drunk from feeling the prick of the thorn stuck in his hand also prevents an ignorant man from experiencing the pain of folly lodging in his heart.
3. He said: Do not confide anything to an ignorant man because he cannot keep it secret; only a wise man⁶ can keep a secret.
4. He said: Just as an arrow that hits a stone is deflected from it, so also an evil word shot at a good man has no effect on him but the fault reverts to the shooter.
5. He urged his students to be generous in dispensing philosophy. He said: "Take as model the practice prevailing in Assyria:⁷ The practice there is

⁵ The addition of the negative by Dunlop in his Arabic edition, absent from all the manuscripts, may be required for the sense: a person who has a reputation of never refusing to give (more likely money than advice) can safely expect his fellow citizens to return the favor when he does the asking. Without the negative, however, the saying becomes sharper, if the sense could be elicited that one should never give (money) lest he becomes impoverished (because of excessive philanthropy) and finds himself in the position of having to ask and not being given:

⁶ Or, "a philosopher," *ḥakīm*.

⁷ The text has Assos, but this story from Herodotus 1.196 clearly refers to Assyria. Assos is the most likely reading of the spelling of the name (ʿsws) in the unique manuscript (Fatih 3222) of the *Muḥtaṣar Ṣiwān al-ḥikma* where this saying occurs. A parallel passage in another recension of the *Ṣiwān*, in which this saying is attributed to Plato, has "as-Sūs al-Aqṣa," "the Farthest Sūs;" this refers to the Moroccan Sūs near the Atlas and is clearly a scribal "emendation"; for this version see Gutas (1975) 119–21, 336–37. In Herodotus (1.196), however, the custom described here is attributed to the Assyrians, thus almost certainly making Assyria the reading of the proper name (see Gutas, *ibid.*). It is tempting to read the name as Assos in the Troad and thus put Eudemus also among the group of philosophers around Hermias, as W. Jaeger (1948) would seem

that the beautiful daughters of its inhabitants send their dowries to the ugly ones so that these can be in demand for their wealth just as the beautiful ones are in demand for their beauty. You, my students, are in demand for [your] philosophy; give, then, liberally some of it to the ignorant so that they can benefit from it and so that your excellence become manifest and your philosophy bear fruit among them!”

6. He said: The vocable is matter, the meaning form; speech is appearance, and style the beauty of appearance.
7. He was asked, “How far has your thought reached?” “It has reached,” he replied, “a level encompassing the entire extent of the thoughts of my contemporaries. Whenever I examine the extent of a thought by reflection, I acquire a comprehensive knowledge of its extent, not having failed to gain cognizance of it, and I know that I have surpassed it.

A man knows more than someone else only when he acquires a comprehensive knowledge of the sum total of his [the other person’s] thought—I mean the farthest point to which his thought has reached, and the sum total of the paths it has become aware of and followed in accordance with the level it has reached in proceeding along the right way.⁹ One then exercises his thought as if there were a limit[ed scope] in everything that his thought concentrated on; and when a man knows the way to proceed, he is safe from erring and slipping.”

8. He said: The true and clear melody is that which expresses fully the high-mindedness of the soul. Any craftsman who can reveal, to the highest possible degree, the form which is in the soul so that it comes out until it becomes perceptible, is wise.
- 9.1 He said: The most vicious predator is a stepmother.⁹
- 9.2 He was asked, “What can detract from [the viciousness of] a predatory animal?” “I don’t know,” he replied, “any predatory animal more vicious than a stepmother.”¹⁰

to believe (see p. 110 n. 2 of the preceding page), though K. Gaiser does not mention him at all in this context. On the other hand, it seems more plausible that the story itself about Assyrians was retold by Eudemus, on the basis of Herodotus, in one of his cultural histories, and from there adapted, with the moral attached, for the *gnomologia* (this hypothesis, which I now consider more likely, I did not entertain in my study cited above.)

⁸ There is a slight textual uncertainty here. With a different emendation of the text (preferred by Badawī), the phrase “in accordance with” could be read with the following sentence. The general meaning, though, seems to be clear: when one knows how to proceed, the thoughts that need to be considered become circumscribed and thus more amenable to analysis.

⁹ For *imra’atu l-ab* = μητρυνία, see *GALex* p. 17, s.v. ‘abun’ 6.

¹⁰ Apparently this saying was transmitted in two forms, as an ἀπόφηνγμα (9.1) and as a χρεία (9.2); the author or a redactor of the *Ṣiwān* put both together.

10. He was told, "So-and-so, your enemy, has died." "I wish," he replied, "you had said that he got married."
11. He looked at a dead man and said, "Here is a warner who, soundless, is calling out to the heedless; motionless, is moving those looking at him; and insentient, is arousing the senses."¹¹
12. He said: Just as death is something bad for those for whom life was good so also is it good for those for whom life was bad. So death is not an absolutely bad it is <also> good <—no, rather death is neither good nor bad but> it becomes good or bad only with reference to something [else].¹²
13. Asked whether there was anyone in the world that is faultless he replied, "No, because someone faultless is immortal."¹³
14. He was asked about the amount of benefit people derive from philosophy. He said: "When a person brings together all [parts of] philosophy and is both surrounded by and encompasses them, he becomes like someone who, having completed his crossing of the sea and reached the destination of his journey, looks back at the others who are beset by encircling waves and raging winds."¹⁴
15. He said: It is good fortune for a man that his appetites pass away; it is also good fortune for him to be obliged to serve philosophy and its adherents.
16. He also said: Be content with just enough [for a living];¹⁵ for anything beyond that has disastrous outcome and grave consequences.
17. He said: Beware of discord because it cultivates evil just as rain cultivates seed.
18. He said: Undertaking the unbearable is foolishness; pursuing the unattainable is distressing; promising the unrealizable is shameful; spending uselessly is mismanagement; and attaining undeservedly a high position is standing on the brink of disaster.
19. He said: Fate¹⁶ subdues time, and the vicissitudes [of fate] subdue generated beings.

¹¹ This saying is similar, though not exactly parallel, to numerous sayings uttered by philosophers at Alexander's tomb. For a general orientation see Brock.

¹² This saying, in exactly the same wording, is attributed to Anaxagoras by Mubaššir (p. 317 Badawī) and by Tawhīdī in his *Risālat al-Hayāt* (p. 68 Kaylānī). Šahrazūrī's lacunose text above is completed from Tawhīdī.

¹³ Cited under the name of Socrates by Ibn-Abī-ʿAwn 50/714 in Rosenthal.

¹⁴ Šahrazūrī alone adds a final phrase "while he is at rest and calm," which would appear to be an addition in the Arabic transmission either by Šahrazūrī himself or his immediate source.

¹⁵ For the concept and cultural context of "sufficiency" (*kafāf*), see the passages cited by Ullmann in *WKAS* I 244b30–245b14.

¹⁶ Fate in the sense of eternal time, *dahr*, which most likely renders here the Greek αἰών (cf. *GALex* p. 10; s.v. "abadiyyun" 4.1), while "time," *zamān*, would be a translation of χρόνος.

20. He said: A tongue that is used in mentioning the first creator ought not to engage in obscenities.
21. He said: The person who sees people's defects most clearly is he who is blinded by his own flaw.
22. He said: God alone is perfect; he did not exempt any of his creatures from defect.
23. He said: The fortune of someone endowed with reason is a spiritual¹⁷ [good] fortune, while the fortune of someone endowed with ignorance is his [ill] fate.
24. He said: Success comes through determination, determination through pondering over [matters], and pondering through safeguarding secrets.
25. He was asked, "When is simple-mindedness praised?" "When it is connected with nobility," he replied. "And when is intelligence blamed?" "When it is associated with lowliness."¹⁸
26. He said: Nothing is more precious than life, and no fraud graver than spending it for any [purpose] other than [the pursuit of] eternal life.¹⁹
27. He was asked what the impossible²⁰ is and he replied, "What has no form in the soul."
28. He said: When a ruler favors you, be with him like a spearhead even if he is friendly with you, for you cannot be sure that he will not turn against you; treat him gently as you would a child, and talk to him as he pleases.²¹
29. He said: That which consoled you for [the death of] your father will also console your sons for you[r death].

¹⁷ "Spiritual," *rūḥānī*, may be translating *θεῖος*, "divine," here; see *GALex* p. 10; s.v. "abadiyyun" 3.2.

¹⁸ Apparently here nobility and lowliness of birth are intended. Cf. F. Rosenthal *Ibn-Abī-ʿAwn* 66/730, for a similar set of questions asked of an anonymous philosopher.

¹⁹ This saying is attributed in the *Muḥtaṣar* also to Socrates (f. 6a) and to an anonymous companion of Aristotle (f. 16a).

²⁰ Arabic *muḥāl*, the logically impossible or absurd.

²¹ This and the following saying occur in the *Muḥtaṣar* only, represented by the unicum MS Fatih 3222. In this MS, the end of the section on Eudemus is not marked by the name of the following philosopher whose sayings are recorded (ʿshwłws); the name of ʿshwłws is missing, as are the brief biographical sentences about him (see below, no. 1.2 in Section III). The sayings of ʿshwłws follow uninterruptedly after those of Eudemus. The saying which comes after no. 29 here is attributed to ʿshwłws in the *Muntaḥab*, and this is how we can tell that the Eudemus section has actually ended in the *Muḥtaṣar*. But since nos. 28 and 29 occur only in the *Muḥtaṣar*, we cannot tell whether they were attributed to Eudemus or ʿshwłws in the original *Šiwān*. If they were sayings by ʿshwłws, then the Eudemus section in the *Šiwān* would contain twenty-seven sayings.

III. Biographical References to Eudemus

1. *Depository of Wisdom Literature* (*Muntaḥab Ṣiwān al-ḥikma*, ll.1172–75, 1231–32 Dunlop):

1.1 [From the life of Theophrastus, FHS&G 4A]: [Theophrastus] was assisted in the instruction of the students of philosophy and of beginners, and in the performance of the tasks entrusted to him, by Eudemus and 'ṣḥwlws,²² both of whom were also among the eminent pupils of Aristotle.

1.2 [From the life of 'ṣḥwlws]: 'ṣḥwlws was also one of the major companions of Aristotle the philosopher. He was equal in importance to Theophrastus and Eudemus, which we mentioned earlier. Alexander [the Great] thought very highly of him and counted him among his peers.

2. Ibn-an-Naḍīm, *Index (al-Fihrist)*, p. 255.15 Flügel = Gutas (1985) p. 82, no. I):

I found on the flyleaf of a volume written in an old hand the names that have reached us of the commentators on the logical and other philosophical books by Aristotle. They are Theophrastus, Eudemus, Herminius (?),²³ Boethus, Iamblichus, Alexander, Themistius, Porphyry . . .

3. Mubaṣṣir ibn-Fātik, *Choicest Maxims and Best Sayings* (*Muḥtār al-ḥikam*, 183.6–11 Badawī = Gutas [1985] p. 78–9, nos. IV.1, 3), in the life of Aristotle:

Aristotle had many students among kings, princes, and others.

²² The name remains unidentified; see Gutas (1985) 74 note b. One would expect Clearchus and Dicaearchus, the two closest colleagues of Theophrastus and Eudemus in the Peripatos, but the skeletal form of the name could not support such a reading. What it could support is Antigonos, possibly Antigonos the Great, especially since in the brief biographical notice on him in the *Ṣiwān* he is said to have been highly respected by Alexander the Great, and confused in the Greek sources with Antigonos Gonatas, the great patron of philosophers in Athens. But all this is speculation.

²³ This is either a doublet for Eudemus (the two names in Arabic transcription look very similar) or a reference to Herminius, the teacher of Alexander of Aphrodisias (cf. Gottschalk 1987. 1158). The context in which this name is found in the *Fihrist* would lend support to the former alternative, although the re-occurrence of the doublet in Mubaṣṣir and Ibn-al-Qiftī in items 3 and 5 below would indicate the latter.

The following are some of the most excellent ones among them who were famed for their knowledge, distinguished in philosophy, and known for their noble descent: Theophrastus, Eudemus, Alexander the King, Eudemus,²⁴ ṣḥwlws, and others. . . . Helping and assisting Theophrastus in this [task, i.e., in his professorial duties] were two men, one of them called Eudemus and the other ṣḥwlws. They all wrote books on logic and philosophy.

4. Masʿūdī, *at-Tanbīh* (121 de Goeje = Gutas [1985] p. 82. no. II):

We mentioned in the book *Varieties of Knowledge* the reason why political philosophy began with Socrates and then [continued with] Plato, then Aristotle, then his maternal aunt's son, Theophrastus, then Eudemus, and those who came after him, one after the other.

5. Ibn-al-Qifṭī/Zawzanī, *History of the Philosophers (al-Muntaḥabāt min Aḥbār al-ḥukamāʾ)*, p. 59.18–60.3 Lippert):

5.1 Eudemus. One of the Byzantine philosophers who became pre-eminent in his time in instruction in this field. He was an authority on the philosophy of Aristotle and wrote works commenting on some of his books.

5.2 Eudemus.²⁵ Byzantine philosopher who engaged in this field. He instructed his contemporaries and commented on some of the books by Aristotle.

IV. Logic

1. Ibn Buṭlān, *Against Ibn Riḍwān* (= Gutas [1985] p. 90–1):

On the causes why he who learns from oral instruction by teachers learns better and more easily than he who learns from books: ...

²⁴ Mubaššir's text has ṣrmīnūs, but this would appear to be a doublet for Eudemus rather than a reference to Herminius. The context here would hardly justify a reading of Herminius; see the note to the preceding entry.

²⁵ Ibn-al-Qifṭī's text has actually ṣrmīnus, though this is possibly a doublet for Eudemus; see the preceding two notes. Alternatively, both entries 5.1 and 5.2 in Ibn-al-Qifṭī could refer to Herminius, rather than to Eudemus, since the person is described as a "Byzantine" (*Rūmī*), which is Ibn-al-Qifṭī's designation for scholars who lived in Imperial times, as opposed to "Greek" (*Yūnānī*) for authors of the classical and Hellenistic periods.

[Another argument in support of this is] that which the commentators have said about the substitution of the simple negative [proposition] by the modified [/equivalent] affirmative [proposition]; for they agree that this section would have never been understood by a reading of the book had not Aristotle's disciples, Theophrastus and Eudemus, heard it explained by their master. If this is so, then understanding from a teacher is better than that from a book.

2. Fārābī, *On Aristotle's De Interpretatione* 4, 17a6–7 (53.6–12 Kutsch and Marrow = FHS&G111C):

[Aristotle] does not examine the composition of hypothetical [statements] at all in this book, and only slightly in the *Prior Analytics*. The Stoics, on the other hand, Chrysippus and others, examined it thoroughly to the point of excess, made a thorough study of hypothetical syllogisms—as Theophrastus and Eudemus had done after Aristotle's time—and claimed that Aristotle wrote books on hypothetical syllogisms.

3. Averroes on *Prior Analytics* 1.8 (29b26–30a2):

- 3.1 Averroes, *Quaesita* 4 (*Masā'il* 4, p.114.10 Ḳalawī = FHS&G 98B):

Our purpose in this essay is to enquire into the premise which is called existential and absolute: what it is and what Aristotle's doctrine about it is, for the commentators have disagreed about this matter. . . .

The doctrine of Theophrastus [and of Eudemus and Themistius] is the following: an absolute and existential premise is one from which have been omitted both the mode of possibility and the mode of necessity, neither one having been explicitly stated in it, while the matter in itself is either necessary or possible.

- 3.2 Averroes, *Quaesita* 7 (*Masā'il* 7, p.156.14 Ḳalawī = FHS&G 98D):

Some of them [the commentators] said that what is meant by the existential premise is that the predicate belongs to the subject absolutely, and that this [premise] subsumes the necessary, the possible, and the actually existent. Al-Fārābī related that this is the doctrine of Theophrastus and Eudemus and of those who professed their view.

4. Averroes on *Prior Analytics* 1.9, 30a33–30b64.1 Averroes, *Quaesita* 5 (*Masā'il* 5, p.127.7 'Alawī = FHS&G 105):

Theophrastus, Eudemus and many of the ancient Peripatetics, and Themistius among the later ones, charged Aristotle emphatically with having committed an error when he said about syllogisms containing a mixture of existential and necessary premises that the mode of their conclusion follows the mode of the major premise. They said that on the contrary the mode of the conclusion follows in every kind of mixture the inferior of the two modes posited in the premises.

4.2 Averroes, *Quaesita* 8 (*Masā'il* 8, p.176.13 'Alawī = FHS&G 106I):

All commentators agree that Aristotle held that the mode of the conclusion follows the mode of the major premise in the first, second, and third figure. . . . No one among the ancients, like Theophrastus and Eudemus, nor Themistius among the later authors, supported him in this view. They said that the mode of the conclusion follows the mode of the inferior premise, i.e., that in this sort of mixture it follows invariably the absolute premise and not the necessary in any way.

4.3 Averroes, *Talḥīṣ* of *Prior Analytics* (p.179.8 Jéhamy = FHS&G 106H):

Theophrastus and Eudemus among the ancient Peripatetics, Themistius among the later ones, and those who followed them are of the opinion that the mode of the conclusion follows the inferior of the two modes, that is, that in such a combination it is found invariably to follow the absolute premise, since absolute existence is inferior to necessary existence.

4.4 Averroes, *Talḥīṣ* of *Prior Analytics* (p.211.22 Jéhamy = FHS&G 106H app. font.):

This is what appeared to be the case to Theophrastus and Eudemus among the ancient Peripatetics, that the mode of the con-

clusion in mixed [syllogisms] always follows the inferior of the two modes of the premises.

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Appendix

Text of Eudemus' Sayings from the *Šiwān al-Ḥikma*

The sayings of Eudemus in Arabic are to be found only in the famous gnomologium *Šiwān al-ḥikma* (*The Depository of Wisdom Literature*), compiled around 1000 A.D. from material translated in the previous two centuries. This gnomologium has not survived intact in directly transmitted manuscripts but indirectly, in two ways: in three separate abridgments and in quotations by later anthologists.²⁶ The original entry on Eudemus in the *Šiwān* (*Depository*) can thus be reconstructed on the basis of the selection of Eudemus' sayings offered in two of the three abridgments, the *Muḥtaṣar* and the *Muntaḥab Šiwān al-ḥikma* (*Abridgment of and Selections from the Depository of Wisdom Literature*), and in the work of one anthologist, Šahrazūri's *Nuzhat al-arwāḥ wa-rawḍat al-afrāḥ* (*Spiritual Entertainment in the Garden of Delights*). The other recensions of the *Šiwān* or anthologies drawing on it do not cite Eudemus. In addition, none of the other great Arabic gnomologies of the 9th–11th centuries (those by Ḥunayn, Ibn-Hindū, and Mubaššir), has sections on Eudemus. The reconstruction of the Eudemus entry in the original *Šiwān* can only be partial; we cannot know that the three sources we have (the *Muḥtaṣar*, the *Muntaḥab*, and Šahrazūri) among them selected all the sayings it contained. Nevertheless, the sayings are given in identical sequence in all three sources, and their total number, twenty-nine, is high enough for a philosopher of Eudemus' rank as to generate the impression that we have recovered, if not the entire entry in the lost *Šiwān*, then definitely a very large part of it.

The Arabic edition of the sayings of Eudemus for the purposes of this paper has presented some particular problems, all having to do with the nature of the Arabic gnomologia and the state of the available editions. Of the three sources mentioned above, the *Muḥtaṣar* is the least problematic. It is extant in a single manuscript preserved in Istanbul in the Fatih collection, no. 3222, to which I have access in the form of a microfilm. Its readings are accordingly fully recorded in my text and apparatus.²⁷

²⁶ For details see Gutas (1982) 646–47; 1985, 68–69.

²⁷ The text of the *Muḥtaṣar* from this manuscript was printed as part of a University of Chicago doctoral dissertation by R. Mulyadhi Kartanegara, *The Mukhtaṣar Šiwān*

The *Muntahab* presents a more complicated picture. It is extant in four manuscripts, three in Istanbul and one in the British Museum. I have a microfilm of one of the Istanbul MSS only, Murad Molla 1408. There are also two independent editions, one by D.M. Dunlop and the other by ʿAbdurrah«mān Badawī. Dunlop's edition, which is based on all four MSS, is essentially a collation copy of the readings of three MSS against the fourth, and its relatively full documentation of variant readings is useful. Badawī's edition, on the other hand, although based on the three Istanbul MSS, has spotty and occasionally inaccurate documentation of variant readings.²⁸ For this reason I have used the text edited by Dunlop and Badawī as controlled by my reading of Murad Molla 1408 on the few occasions of their divergence. For the apparatus I recorded the variants of the other MSS as recorded by Dunlop, but not by Badawī, for the reasons given in Gutas (1982) 649. In order to indicate the derivative nature of my information about the readings of MSS to which I did not have access, I marked the sigla of the MSS with a raised letter, the editor's initial.

The situation is similar with the text of Šahrazūrī. There are numerous MSS and three editions that I know of, by Ahmed, Abū-Rayyān, and Abū-Šuwayrib, all quite poor. The text on Eudemus in Šahrazūrī is quite short, however, and a measure of control over the editions has been gained by my recourse to the London MS British Museum Add. 25738. Variant readings recorded in Ahmed's edition have also been indicated by a raised initial letter marking the MS sigla.

Two other factors complicate the process of editing the sayings of Eudemus. One is the uniqueness of the *Šiwān* entry on Eudemus. As mentioned earlier, there are no traces whatsoever in the Greek tradition of any sayings ascribed to Eudemus; the edition of the Arabic sayings can thus expect no help from the Greek. The second is that some of the sayings ascribed to Eudemus in the *Šiwān* may appear elsewhere in the voluminous Arabic gnomologia under different names.²⁹ A proper

al-Ḥikma of ʿUmar b. Sahlān al-Sāwī, Chicago 1996. It offers no improvement on the text of the manuscript but rather adds mistakes of its own. It has not been taken into account.

²⁸ See my comparative review of these editions in Gutas (1982) 648–49. Cf. also Daiber (1984) on Dunlop's edition.

²⁹ The few instances that I have noticed have been cited in the notes to the translation.

evaluation of the text of the Arabic sayings is thus feasible only in the context of the entire corpus of Arabic gnomologia, something which could not be undertaken for the purposes of this paper.

Under these circumstances, it seemed best to provide an apparatus criticus that would present the documentation completely, i.e., a positive apparatus. All variants in the MSS of all the works accessible to me have been fully recorded. The procedure with the *Muḥtaṣar* I have mentioned above. For the *Muntaḥab* I recorded fully the readings of MS Murad Molla 1408, and for the rest I used the variants recorded by Dunlop. However, Dunlop's apparatus is negative, so although theoretically every time the reading of a MS is not recorded in the apparatus the inference is that it is identical with that accepted in the main text, I have refrained from drawing the inference and adding these supposed readings in my apparatus. The reader should keep in mind that for the *Muntaḥab* variants, the absence of a reference to some of the MS readings is due to Dunlop's negative apparatus. For the text of Šahrazūri, finally, given the paucity and unreliability of the documentation of the variants in the three editions, I have drawn primarily on the British Museum MS, whose readings are fully recorded, and gave the variants listed by one of the editors, Ahmed, only in circumstances where they were of obvious merit.

In the apparatus fontium, the numbers following the name of the sources refer to the relative sequence of the sayings in each source.

Abbreviations

add.	added in; added by (for material missing in the mss and added by editors in angular brackets < >)
app.	apparatus criticus
appar.	apparently (<i>ut videtur</i>)
codd.	codices, when all the mss agree on a reading
conj.	conjecture(d) by
corr.	corrected by or in, of a miswritten skeleton (<i>rasm</i>), in cases of <i>taḥrīf</i>
mrg.	margin
om.	omitted by or in

- read. reading by or in, in cases of unpointed or wrongly pointed skeleton (*taṣhīf*)
- secl. secluded by (an editor in square brackets [] for material in the mss that is to be deleted)

Sigla

Muḥtaṣar Ṣiwān al-ḥikma

F MS Istanbul, Fatih 3222, ff. 34r–v

Muntaḥab Ṣiwān al-ḥikma

A MS Istanbul, Murad Molla 1408, ff. 31r–v

B^d MS London, British Museum Or. 9033, readings as recorded by Dunlop

C^d (ع in Badawī) MS Istanbul, Beṣir Ağa 494, readings as recorded by Dunlop

D^d (د in Badawī) MS Istanbul, Köprülü 902, readings as recorded by Dunlop

Badawī Badawī edition, pp.178–81

Daiber Daiber (1984), pp.48–67

Dunlop Dunlop edition, lines 1200–29

Mḥb Agreement of all MSS and editions of the *Muntaḥab*

Šahrazūrī

Z MS London, British Museum Add. 25738

J^a (م in Ahmed) MS Manchester, John Rylands, readings as recorded by Ahmed

L^a (س in Ahmed) MS Salar Jung, Taʿrīḥ 10, readings as recorded by Ahmed

V^a (اصل in Ahmed) MS Ās«afiya, Taʿrīḥ 686, readings as recorded by Ahmed

Ahmed Ahmed edition, pp.303–4

Abū-Rayyān Abū-Rayyān edition, pp.314–15

Abū-Šuwayrib Abū-Šuwayrib edition, pp.175–76

Šz Agreement of all MSS and editions of Šahrazūrī

[من صوان الحكمة]

اوذیموس

كان أيضاً من تلامذة الحكيم أرسطوطيلس والمدرسين لعلمه
وحكمته والمصنّفين للكتب على قوّة كلامه ونمط تأليفه ونسبتها إليه
(١) وقيل له لِمَ <لا> تمنع من يسألك فقال لثلاث أسأل من يمنعني
(٢) وقال يمنع الجاهل من أن يجد ألم الحمق المترع في قلبه ما
يمنع السكران من أن يجد مسّ الشوكة الداخلة في يده
(٣) وقال لا تُسرّ إلى الجاهل شيئاً فإنّه لا يطيق كتمانَه ولا يطيق
كتمان السرّ إلاّ حكيم
(٤) وقال كما أنّ السهم إذا أصاب حجراً نبا عنه كذلك الكلمة

Title and biography *Muntaḥab, Muḥtaṣar, Šahrazūrī* (1) *Muntaḥab* 1, *Muḥtaṣar* 1 (2) *Muntaḥab* 2, *Muḥtaṣar* 2 (3) *Šahrazūrī* 1
(4) *Šahrazūrī* 2.

Title اوديموس : A اوذيموس : F Dunlop Badawī Abū-Rayyān | اوديموس : Ahmed : om. *Šz* | **Biography** ايضا F *Mhb* : om. *Šz* | Dunlop Badawī ارسطوطاليس : AB^dC^d | ارسطوطاليس : *Mhb* : om. F *Šz* | *Šz editions* : Z ارسطوطاليس : F D^d *Šz* : om. F | *add.* <لا> | F قيل : *Mhb* وقيل (1) *Mhb* : om. F *Šz* | ونسبتها إليه : om. F | Dunlop (2) من F Dunlop Badawī السريع : A السريع : F المتربع 1 (2) Dunlop A Dunlop من : C^d in mrg. : من F A Dunlop | منه Badawī : J^a احسن : Ahmed : تسم : Abū-Rayyān Abū-Šuwayrib | تسم : 1 (3) *read.* *Šz* : Z Ahmed : الحكيم Z *Šz* : appar. Z || 2 *Šz* : L^a | يشير : Abū-Šuwayrib الحكيم : Z Ahmed : الحكيم : Z *Šz* : appar. Z || 2 *Šz* : L^a | يشير : Abū-Rayyān.

السوء إذا رُمى بها الرجلُ الصالح لم تنجع فيه فيرجع العيبُ إلى الرامي
(٥) وحثّ تلامذته على بذل الحكمة فقال امتثلوا السنّة التي في
اسوس فإنّ السنّة هناك أنّ الحسان من بنات أهلها يبعثن بمهورهنّ إلى
القبايح منهنّ لينفقن بالمال كما نفقت الحسان بالجمال وأنتم معاشر
التلامذة فقد نفقتم بالحكمة فجودوا على الجهال ببيع حِكمتكم
لينتفعوا بذلك فيتبيّن فضلُكم وتثمر حِكمتُكم عندهم

(٦) وقال اللفظة هيولى والمعنى صورة والنطق منظر والبلاغة جمال
المنظر

(٧) وقيل له أين بلغت فكرتُك فقال بلغت الدرجة التي تحيط بمبالغ
فكر أهل دهرى فمتى تصفّحتُ مبلغ فكرة مفكِّراً أخطتُ بمبلغها علماً
ولم أقصّر عن معرفتها وعلمتُ أنّي تجاوزتها وإنّما يكون المرء عالماً
أكثرَ علماً من غيره إذا أحاط علماً بمقدار فكرته — أعنى إلى أى مبلغ
انتهت فكرته وما مقدار ما عرفت من المسالك وتوجّهت إليه [ف]على
حسب الدرجة التي انتهت إليه من طريقة السلوك الصحيحة — فيروض
فكرته كأنّ في كلّ ما تصرفت فيه فكرته مَقْصِراً وإذا علم المرء طريقة

(5) *Muḥtaṣar* 3

(6) *Muntaḥab* 3

(7) *Muntaḥab* 4.

(4) 2 read. Abū-Rayyān : ينجع : Z : تنجع
Abū-Rayyān | ويرجع : Ahmed Abū-Šuwayrib | ويرجع : Z J^a : فيرجع
Ahmed V^a الذي عابه : Abū-Šuwayrib Abū-Rayyān : Z J^aL^a الرامي
Badawī : فكرة 2 (7) *Mḥb* والنظر : conj. Dunlop in app. (6)
A : اسهت read. Dunlop Badawī : انتهت 6 || Gutas || 5 Dunlop A فكره
Dunlop : فيروض | اليها *Mḥb* instead of sic اليه | C^d انتهت
Dunlop Badawī : مقصراً : A : مقصراً : Gutas || 7 Badawī يروض

السلوك أمِن عليه الزيف والزلل

(٨) وقال اللحن الصحيح المفصح هو المستوفى لهمة النفس وأيما صانع أظهر الصورة التي في النفس حتّى تخرج إلى أن يقع عليها الإحساس على أقصى ما يمكن إظهارها فهو حكيم

(٩) وقال أخبث السباع امرأة الأب

(٩.١) ف قيل له أيما يسلب عن السباع فقال أنا لا أعرف من السباع

سبعاً أخبث من امرأة الأب

(١٠) وقيل له مات فلان عدوك فقال وددت أنكم قلتم إنه تزوج

(١١) ونظر الى ميت فقال هذا نذير ينادى الغافلين بلا صوتٍ ويحرك

الناظرين إليه بلا حركة وينبّه الحواس ولا حساً له

(١٢) وقال كما أنّ الموت رديء لمن كانت الحياة له جيّدة كذلك

هو جيّد لمن كانت الحياة له رديئة فليس الموت رديئاً مطلقاً بل جيّد

> أيضاً لا بل ليس الموت جيّداً ولا رديئاً لكنّه < بالإضافة إلى شئ

يكون جيّداً أو رديئاً

(8) *Muntaḥab* 5 (9) *Muntaḥab* 6 (10) *Muntaḥab* 7, *Muḥtaṣar* 4

(11) *Muntaḥab* 8, *Muḥtaṣar* 5 (12) Šahrāzūrī 3; cf. Tawḥīdī p. 68.

(8) Dunlop Badawī صانع 2 || AB^dC^d وانما : Dunlop Badawī D^d وايما 1 (9) 2 A Dunlop Badawī صانع : B^d يخرج : read. Dunlop Badawī C^d | الصانع : A أنا | Badawī من : A Dunlop عن | A Dunlop انما : read. Badawī أيما Dunlop : om. Badawī (10) Mḥb : om. F إنه (11) F Dunlop فقال : om. A (12) 1 B^d يريد : F A Dunlop Badawī نذير : om. A (13) 2 V^a Šz eds. : om. Z || 1-2 جيّدة ... الحياة له : om. Z J^aL^a || 2 second Z Ahmed Abū-Šuwayrib : add. Gutas جيّد : Abū-Rayyān Abū-Šuwayrib في الاضافة : Z Ahmed بالاضافة | from Tawḥīdī || 3 Z Ahmed Abū-Šuwayrib جيّد أو 4 ||

(١٣) وقيل له هل يوجد في الدنيا من لا عيب فيه فقال لا لأن من لا عيب فيه لا يموت

(١٤) وسئل عن قدر انتفاع الإنسان بالحكمة فقال إن الإنسان إذا حوى الحِكم كَلَّها والتحف بها واشتمل عليها كان مثله مثل الإنسان الذي بلغ بسيره في البحر إلى مقصده في سفره فهو ينظر وراءه إلى غيره مكروباً بالأموال المُحدقة به والرياح المُختَرقة عليه

(١٥) وقال من حُسِنَ جَدَّ الإنسان أن تفوته شهوته ومن حسن جدّه أن يضطرَّ إلى خدمة الحكمة وأهلها

(١٦) وقال أيضاً اقنع بالكفاف فإن ما فوقه عاقبته وخيمةٌ والتبعة فيه عظيمةٌ

(13) *Muntaḥab* 9 (14) *Muntaḥab* 10, *Muḥtaṣar* 6, Šahrazūri 4 (15) *Muntaḥab* 11 (16) *Muntaḥab* 12 (17) *Muntaḥab* 13, *Muḥtaṣar* 7

(13) *Mḥb* Šz : الإنسان 1 first C^d Badawī له A Dunlop فيه 1 (13) إذا حوى الإنسان : Badawī إذا حوى : F A Dunlop إن الإنسان إذا حوى | F الناس | Šz : om. Šz | *Mḥb* : om. Šz | والتحف بها | Šz : om. Šz | الحكمة : *Mḥb* : F الحكم كلها 2 || Šz | بسيره 3 || Šz : الواصل : *Mḥb* : F الإنسان الذي بلغ بسيره 2-3 || Badawī : om. Badawī | في | D^d : om. Šz : F A Dunlop Badawī البحر إلى | A سيره : Dunlop Badawī : om. Šz | وراءه : F | Z J^aL^a : ينظره : *Mḥb*, Šz : F ينظر | Šz : om. Šz : F سفره : Dunlop Badawī : om. A Šz || 4 به F A Dunlop J^aL^a Šz : om. V^a Badawī : read. Dunlop Abū-Šuwayrib Abū-Rayyān : المختَرقة | Ahmed : المختَرقة : Badawī : المختَرقة : C^d : F AB^dD^d J^a Z : وهو مطمئن وادع : Z Ahmed : add. عليه after (15) first من : read. Badawī : Abū-Šuwayrib Abū-Rayyān : حزنه : read. Badawī : sic codd. عاقبته (16) A : نفوته : read. Dunlop : نفوته : read. Badawī : فعاقبته instead of and editions : F والمجرأ | *Mḥb* : وياك : F : اياك (17) : A. Dunlop Badawī : والمرء :

(١٧) وقال إِيَّاكَ وَالْمِرَاءَ فَإِنَّهُ يَرْبِي الشَّرَّ كَمَا يَرْبِي الْمَطَرُ الْحَبَّ
 (١٨) وقال تَكَلَّفْ مَا لَا يُطَاقُ سَفَهُ وَالسَّعْيُ فِيمَا لَا يُدْرَكُ عَنَاءٌ وَعِدَّةٌ
 مَا لَا يُنْجَزُ فُضُوحٌ وَالْإِنْفَاقُ مِنْ غَيْرِ فَائِدَةٌ خُرْقَةٌ وَبِلُوغِ الْمَنْزِلَةِ الرَّفِيعَةِ
 مِنْ غَيْرِ اسْتِحْقَاقُ إِشْفَاءٍ عَلَى الْهَلَكَةِ

(١٩) وقال الدهر يستخدم الزمان والحدثان يستخدم أصحاب
 الأكوان

(٢٠) وقال لسانٌ يُذَكِّرُ بِهِ الْمُبْدِعُ الْأَوَّلُ لَا يَنْبَغِي أَنْ يَجْرِيَ بِالرَّفَثِ
 (٢١) وقال أَبْصَرَ النَّاسَ بِعَوَارِ النَّاسِ الْمُعَوَّرُ بَعِيبَ نَفْسِهِ
 (٢٢) وقال إِنَّ اللَّهَ تَعَالَى تَفَرَّدَ بِالْكَمَالِ وَلَمْ يُعَرِّ أَحَدًا مِنْ خَلْقِهِ مِنْ

النقصان

(٢٣) وقال حَفَظَ الْمَرْزُوقَ بِالْعَقْلِ حَفَظَ رُوحَانِيَّ وَحَفَظَ الْمَرْزُوقَ بِالْجَهْلِ
 قَدَرٌ جَرَى بِهِ

(٢٤) وقال الظفر بالحرص والحرص بإجالة الرأي وإجالة الرأي

بتحصين الأسرار

(18) *Muhtaṣar* 8 (19) *Muntaḥab* 14 (20) *Muntaḥab* 15, *Muhtaṣar* 9
 (21) *Muntaḥab* 16, *Muhtaṣar* 10 (22) *Muntaḥab* 17 (23) *Muntaḥab* 18
 (24) *Muntaḥab* 19.

(18) 2 *read. Gutas* : فصوح F | خرقه appar. corr. from خرق F
 (20) F A Dunlop : om. Badawī sic F | بعوار (21) بعوار F A Dunlop : om. Badawī
 with المعور : A المعور : Badawī read. Rosenthal : المعور read. Dunlop : بعور
 written underneath by a second hand F | بعور A Dunlop : بعور
 بعور Badawī : om. F (22) يعر A : يعر read. Dunlop : يعر read.
 Badawī.

- (٢٥) وقيل له متى تُحَمَّد الغباوةُ فقال إذا اتَّصلت بكرمٍ قيل فمتى
تُذَمُّ الفِطْنة فقال إذا اقترنت بلُومٍ
- (٢٦) وقال لا شيء أنفس من الحياة ولا غبن أعظم من إنفادها لغير
حياةٍ أبديٍّ
- (٢٧) وسئل عن المحال فقال ما لا صورة له في النفس
- (٢٨) وقال إذا قربك السلطان فكنْ منه على حدِّ السنان وإن استرسل
إليك فلا تأمن من انقلابه عليك وارفق به رِفْقَكَ بالصبي وكَلِّمْهُ كما يشتهي
- (٢٩) وقال يُسَلِّي عنك بنيك ما أسلاك عن أبيك

(25) *Muntaḥab* 20, *Muḥtaṣar* 12 (26) *Muntaḥab* 21, *Muḥtaṣar* 11 (27)
Muntaḥab 22, *Šahrazūri* 5 (28) *Muḥtaṣar* 13 (29) *Muḥtaṣar* 14.

(25) A Dunlop قال : F فقال 2 || F العبادة : A Dunlop Badawī الغباوة 1 (25)
Badawī | بلوم read. Badawī Daiber : بلوم A Dunlop : originally written
بكرم and corr. to بلوم by the scribe F (26) A Dunlop : إنفادها 1
F Badawī Daiber || 2 حيوة F حيوة read. Dunlop : without vowel
A Badawī (27) *Šz editions*, first version in Z وسئل عن *Mḥb* وقيل له ما :
Abū-Šuwayrib قال : *Mḥb* فقال | second version in Z وقيل له بـ :
Abū-Rayyān من : Abū-Šuwayrib *Mḥb* Z Ahmed Abū-Rayyān في :
F. بعد : Gutas corr. عن (29)



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2

Eudemus and the Peripatos

Hans B. Gottschalk

Aristotle the philosopher, being sixty-two years of age, became sick and weak in body, and there remained little hope of his life. The whole band of his followers then waited upon him, requesting and entreating that he would himself appoint a successor to his office and school to whom, after his decease, they might apply themselves as to himself, in perfecting those studies in which they had hitherto been instructed by him. There were at that time many in his school who were very accomplished, but two of particular merit, Theophrastus and Eudemus. In talents and learning these exceeded the rest. Theophrastus was from the island of Lesbos, Eudemus from Rhodes. Aristotle replied that he would comply with their request, as soon as an opportunity presented itself. A short time after, when all those were present who had consulted him about their future master, he said that the wine he was drinking did not suit his health; it was disagreeable and harsh; he must therefore look out for some foreign wine, from Rhodes or from Lesbos. He begged they would provide him with some of each sort and said that he would use that which agreed with him best. They hasten to find, procure and bring him these wines. When Aristotle, calling for the Rhodian, tastes it, "This," says he, "is a strong wine, and palatable." He next asks for some Lesbian and tasting that too, "Each," says he, "is certainly a good wine, but the Lesbian has the sweeter flavour." When he said this, it was evident to all that, with ingenuity and modesty, he had fixed not upon his wine, but his successor; namely, Theophrastus the Lesbian, a man equally remarkable for the charms of his eloquence and his good conduct. Not long after, Aristotle dying, they all became the followers of Theophrastus.¹

¹ Aulus Gellius 13.5 = Eud. fr. 5W = Theophr. 8 FHS&G; tr. W. Beloe (1795) slightly

This pleasant tale was told by Aulus Gellius, writing about the middle of the second century AD, and is quite unhistorical: Aristotle died in Chalcis, where he had fled to escape from the political upheavals in Athens following the death of Alexander the Great; his school was in abeyance and his will contains no hint that he expected it to revive.² But it seems to have exercised considerable influence on the nineteenth-century view of Eudemus which is basically the one still current: Eudemus as the faithful follower of Aristotle who loyally performed the tasks assigned to him during his master's lifetime and continued his teaching after his death. There is a good deal of truth in this, but in many ways Eudemus' work and career were different from those of most members of the school. He may have been a German professor's ideal of a Peripatetic, but he was not a typical one. In what follows I shall first discuss our knowledge, or perhaps I should say, our ignorance of his career, then his writings, and lastly I shall try to determine what we can say about the character of his work and his contribution to the school.

I

Very little is known about Eudemus' life. We are not told that he belonged to Plato's Academy, but he must have been a member of Aristotle's school for quite a long time; if he joined it soon after Aristotle's return to Athens in 336 BC, he must have been born some years before 350. Presumably he stayed until Aristotle left Athens in 323 and then returned to Rhodes, where he would have enjoyed the security of a citizen and presumably had some property. There he seems to have founded a school, if that is not too grand a title for what must have been virtually a one-man band. We hear that a nephew, Pasikles, may have compiled the essay which later became the second book (*Alpha Elatton*) of Aristotle's *Metaphysics*, but even this is not certain and none of Eudemus' pupils seem to have attained much distinction. Two Rhodian Peripatetics are known in the third century, Praxiphanes and Hieronymus, but there is no positive evidence that either attended his school; both had different interests from his and Hieronymus lived considerably later. Probably Eudemus' school did not survive him. The only relevant piece of evidence we possess, a report in Athenaeus that

altered. The story is repeated by Walter Burleigh, *Vita Arist.* p. 246 Knust.

² D.L. 5.11–16; cf. Gottschalk (1972) 314–42, esp. 317.

the kings of Egypt acquired valuable Aristotelian manuscripts for their library from Rhodes as well as Athens, suggests that Eudemus' collection became available during the second or third decade of the third century, just when one would expect him to have died (we have no direct information about the date of his death.³ But Athenaeus is not a reliable witness; the most we can say is that his assertion shows what he, and presumably his readers, were prepared to believe.

Our ignorance about the circumstances of Eudemus' life is connected with one of the few facts about him which can be firmly established: he seems to have been virtually unknown in the Hellenistic era. Neither Cicero nor Sextus Empiricus, who relied on Hellenistic sources for his knowledge of the Peripatetics, mention his name. The doxographers, including Arius Didymus, say nothing about his teaching.⁴ Diogenes Laertius (1.9, 1.22 = Eud. fr. 89, 144W) cites him twice as an authority for the doctrines of earlier thinkers, but has no biography of him and does not refer to him in the *Life of Aristotle* (his name is included in the list of Aristotle's pupils in the *Vita Latina* and conjecturally in the *Vita Marciana*,⁴ as well as the Arabic tradition). Clement of Alexandria cites his *Astrologikai Historiai* once (fr. 143W), but has nothing to say about his doctrines. It was only after the revival of Aristotelian studies initiated by Andronicus that the "Peripatetic scholastics" rediscovered Eudemus' systematic works and came to appreciate their usefulness for understanding Aristotle. It could have been Andronicus himself who found copies in some neglected corner of his home town, perhaps in the possession of Eudemus' descendants, but again we are not told that he edited them.

However it came about, three systematic works by him, the *Analytika*, *Peri Lexeos* and *Physika*, circulated in the first two centuries AD. Alexander quoted them freely and Galen wrote a commentary on the *Peri Lexeos*.⁶ Of the later commentators, who are our primary

³ Cf. Gottschalk (1972) 339f.

⁴ Eudemus' name only occurs once in Diels' *Doxographi Graeci* (p. 492.3 = Simpl. In Phys. 700.16 = Theophr. Phys. Op. fr. 15 [150 FHS&S] = Eudemus fr. 82aW). This fragment, dealing with Plato's explanation of time, came to Simplicius from Alexander, who will have taken it from Eudemus' *Physika*.

⁵ See Düring (1957) 157 and 106. The *Vita Marciana* is corrupt at this point and has been restored from the *V.Lat.* For the Arabic tradition see Düring (1957) 188, 200, 218.

⁶ Galen, *Libr. Prop.* p. 118 M; the text is corrupt and has been restored by Müller

sources of the *Analytika* and *Physika*, Simplicius appears to have read the *Physika* for himself (see fr. 43–4W), but the rest probably derived their quotations from Alexander, directly or through intermediaries. Simplicius regularly refers to Eudemus by name, while Themistius and Philoponus frequently quote him without naming him, and occasionally include some detail omitted by Simplicius. In the same period the *Eudemian Ethics*, now generally accepted as a genuine work of Aristotle, was often attributed to Eudemus, e.g., by Aspasius,⁷ and this may be the reason why we have no ethical fragments under his name. Aelian and Apuleius refer to animal stories supposedly written by him; some modern scholars have regarded them as spurious, but there is no real evidence as to this (I shall come back to this). The only works of Eudemus occasionally quoted by writers dependent on the Hellenistic tradition are his *Histories of Arithmetic*, *Geometry* and *Astronomy*, but most of the longer fragments even of these have come to us from the Neoplatonist commentators on Aristotle or on mathematical writers.

Looking at the list of Eudemus' works, one thing strikes us immediately: the absence of the popular, "exoteric" writings on ethics and literary history which bulked large in the output of most Peripatetics and became the hallmark of the school in the Hellenistic period. Eudemus concentrated on the hard core of Aristotle's philosophy, and most of his writings, like the *pragmateiai* of Aristotle and Theophrastus, were closely connected with his teaching. This may account for his failure to make any impact on a wider public; on the other hand, he was the only pupil of Aristotle, other than Theophrastus, known to have taken an active part in the propagation and development of the doctrines found in Aristotle's school treatises.

II

Those works of Eudemus of which we have any real knowledge fall into two groups: systematic and historical. The second group, containing the histories of arithmetic, geometry, astronomy and perhaps the-

(1891) I.XXXV. Wehrli did not include this testimonium among Eudemus' "fragments," but cites it (p. 89) in his commentary on fr. 25–9. We also have an isolated fragment of a work Περὶ γωνίας, transmitted by Proclus (= fr. 30W). The attribution of a *Categories* to Eudemus by some late authors is baseless; see Gottschalk (1987) 245ff.

⁷ Aspasius *In Eth. Nic.* 151.24 et passim (see the index in Heylbut's edition); cf. Gottschalk (1987b) 1101, 1157f., with references.

ology, is generally assumed to have been conceived as part of a greater project, initiated by Aristotle himself: a series of surveys covering all the philosophically interesting fields of knowledge, which included Theophrastus' *Physikai Doxai* and Menon's *Iatrika*, as well as those of Eudemus. They will have been compiled during Aristotle's lifetime at Athens, the only place where Eudemus could easily have got hold of the necessary research materials.

This raises the question whether, or to what extent, his reading of his sources was affected by Aristotelian preconceptions, a question which has long bedevilled our understanding of Theophrastus' historical works. But it looms less large in connection with the history of mathematics, since in most respects Aristotle's teaching was in accord with the assumptions of mainstream mathematicians, e.g., in accepting the "Euclidean" notion of space, if you will allow the anachronism. The only point on which there was a fundamental disagreement between him and any major group of mathematicians was the existence of indivisible lines, and here Eudemus adopted the Peripatetic position. Thus he agreed with Aristotle in rejecting Antiphon's attempt to square the circle as contravening a basic principle of geometry, the infinite divisibility of magnitudes.⁸ In general, however, these works seem to have contained more straight reporting, and less criticism, than the *Physikai Doxai*. In particular, many of the extant fragments make a point of determining who first discovered a phenomenon or theorem, but then such observations are easier to make and more illuminating in connection with the special sciences than the history of philosophy.

When we turn to Eudemus' systematic writings, the situation is more complicated. We have fairly extensive fragments of three: the *Analytika* (fr. 9–24W), the *Peri lexeos* (fr. 25–9) and the *Physika* (fr. 31–123). Like the corresponding works of Aristotle and Theophrastus, they reflect Eudemus' lectures closely (see in particular fr. 88), even if they were more than lecture notes in the ordinary sense. Yet there are differences between them which are not only due to the differences of their subject-matter. The *Physika*, of which we have by far the fullest reports, was based on a course of lectures covering the same subjects as Aristotle's *Physics* in the same order (see especially fr. 98), except that it contained nothing corresponding to Book 7 of our version. The ex-

⁸ Fr. 140W. But the sentence near the beginning of the extract printed by Wehrli (1969, 57.27f.) which contains a verbal echo of Aristotle (*Phys.* 185a18), is the work of Simplicius; he only refers to Eudemus later, at 59.11.

tant fragments contain no doctrinal innovations and Eudemus' contribution seems to have been limited to changes of presentation and emphasis (more on this later). Our reports of his *Analytika* are more sporadic, but this work brought some important modifications of Aristotle's doctrine: a new method of proving the convertibility of certain kinds of proposition; the recognition of five kinds of syllogism, which Aristotle treated as variants of other moods, as independent moods of the first figure; the introduction of the *in peiorem* rule in modal syllogistic; and some advances in the theory of "hypothetical" syllogisms. If this were all we knew about the work, Eudemus would count as a considerable logician in his own right, but now comes the rub: all of these doctrines are attributed to him and Theophrastus jointly. The only major fragment ascribed to Eudemus alone (fr. 23W) contains a detailed discussion of the meanings of "hypothetical" which might have been useful for elementary students, but makes no advance in logical theory.⁹

The *Peri lexeos* shows rather more independence. Unlike the books with the same title written by Aristotle and Theophrastus (D.L. 5.24 = Arist. *Rhet.* 3; 5.47), it was not concerned with the stylistic, but the logical aspects of language. Of the four certain surviving fragments (frs. 25–8),¹⁰ one asks in what circumstances questions count as "propositions" (προτάσεις), two show Eudemus differing from Aristotle as to whether the "is," in sentences of the form "A is B," is part of the predicate or only a link between the subject-term and the predicate-term, while the fourth informs us that Eudemus gave an account of the "third man" argument similar in all essentials to the one found in Aristotle's *Peri ideôn*.¹¹ One wonders how this came to be included in a treatise on

⁹ The last fragment printed under this head by Wehrli (fr. 24) is also attributed to Eudemus alone, but consists of a historical note about Speusippus' views on definition which may have come from a different work.

¹⁰ 29W, from Galen's *De captionibus in dictione*, refers to a certain source of examples of fallacies; in the older editions, its name is given as (the book of) Eudemus, but the unique MS may read εὐδύμου rather than εὐδήμου and Ebbesen has printed Εὐθυδήμου in his edition (1981, 2:18; cf. 1:14–16). He cites Alcinoos *Didasc.* p. 159.39 H in support of his conjecture and further confirmation is offered by Simpl. *In Cat.* 22.11ff. This passage can no longer be safely attributed to Eudemus, and it is now doubtful whether his *Peri lexeos* included a treatment of fallacies. See Fortenbaugh in this volume.

¹¹ Alex. Aphr. *In Metaph.* 83.34ff. = Arist. *Fragmenta* pp. 125–6 Ross; 380a36–381a32 Gigon. Wehrli (1969) only prints a very short extract as Eud. fr. 28.

language; perhaps the theory of Forms was brought into a discussion of meaning. While these fragments do not allow us to reconstruct the *Peri lexeos* even in outline, they are enough to indicate its subject matter. An almost pedantic concern with verbal expression and verbal distinctions can also be observed in some of the fragments of Eudemus' *Physika*, e.g., frs. 61, 83, 92, 94–6, 102.¹²

Finally there is one series of fragments which is entirely different from all the others: half a dozen stories about animal behaviour preserved by Aelian (frs. 127–32). The subject was a popular one in the early Peripatos; it occupies the ninth book of Aristotles' *Historia animalium*, Theophrastus wrote separate treatises *On the Intelligence and Habits of Animals* (350 no. 11 FHS&G) and *On Animals Said to be Grudging* (362 FHS&G), and Strato one *On Animals about Which Strange Tales are Told* (fr. 93W); Klearchos was the author of several monographs on similar topics and included at least two stories about the love of animals for humans in his *Erotikos* (frs. 101–5, 27–8W). However, these authors did not all treat their material in the same way. Aristotle is factual and objective, even when describing how some hunters collaborate with wild animals (*HA* 620a33ff.), Theophrastus (and probably Strato) tried to find rationalistic explanations, while Klearchos was more concerned to tell an entertaining story. Eudemus' treatment seems to have been closer to that of Klearchos than the others, and this has led some scholars to doubt his authorship of these fragments (see Wehrli's note, p. 112); but they may have been altered by an intermediate source, or Eudemus may have had his relaxed moments, as Theophrastus did when writing the *Characters*. In one fragment at least he makes a point which Aristotle raised several times, when he contrasts the effortless way in which animals acquire their instinctive

¹² Cf. Ioannes Italos, *Quaest. Quodlibetales* 91, p. 139.31 Ioannou: Εὐδημος δὲ ὁ Περιπατητικὸς καὶ Ἀλέξανδρος τὸ μὲν ποιητικὸν ἀρχὴν ὀνομάζουσι μόνως, τὴν δὲ ὕλην στοιχεῖον. τὸ δὲ εἶδος καὶ τὸ δι' ὃ οὔτε ἀρχὴν οὔτε στοιχεῖον, ἀλλὰ μόνον αἴτιον. A late scholiast on the *De interpretatione* mentions a work *Peri lexeos* written by an unnamed follower of Aristotle which, he claims, was related to Aristotle's *Categories* much as Theophrastus' *Peri kataphaseos kai apophaseos* was related to the *De interpretatione*. In an earlier article (cited in n. 6 above, p. 246f.), I took this to be a reference to Eudemus' work, but it may rather refer to one mentioned by Simpl. *In Cat.* 65.6, entitled *Ta peri ten lexin*, which apparently discussed the application of grammatical distinctions to the *Categories*.

modes of action with the toil and pain with which humans learn their skills.¹³

Is it possible to date these writings? The *Physika* probably belongs to Eudemus' Rhodian period; his own words in fr. 88 and the style of many of the fragments show that it was based on a lecture course, and the fact that Eudemus consulted Theophrastus by letter about a difficulty he found in the text of Aristotle's *Physics* indicates that he was not in Athens when he composed the definitive version of this work (he may have given an earlier version of the same course while still in Athens, but no remains of such a version are extant, if it ever existed). The date of the *Analytika* is harder to determine. The close agreement between it and that of Theophrastus suggests that both were the outcome of joint discussions, which can only have taken place at Athens, and this becomes even more likely if their innovations were stimulated, or at least sanctioned, by Aristotle, as one scholar has suggested.¹⁴ Even so, it is most likely that the work received its final form, from which our fragments are presumably derived, at Rhodes. We have no evidence at all concerning the date of the *Peri lexeos*. However, there is no sign that any of these works were known in the Hellenistic age, and while arguments from silence are dangerous, this lends some support to the view that they were only written down at Rhodes and forgotten after Eudemus' death.

¹³ Fr. 130W; cf. Arist. *HA* 608a15, *Metaph.* 980b22. These fragments have been discussed in detail by Stephen White and Juha Sihvola (see White's contribution in this volume); they have shown that they reflect concerns which played a part in both the zoological and the ethical writings of Aristotle and must be seen as a serious contribution to current Peripatetic discussions of emotion in humans and animals. I have only two points to add: firstly, Eudemus' accounts are much more elaborate than analogous references to animal behaviour in Aristotle's treatises, and seem to bear much the same relationship to them as the sketches in Theophrastus' *Characters* bear to the descriptions of virtues and vices in the Aristotelian *Ethics*; this suggests that they are unlikely to have been taken from a *pragmateia* but probably came from a separate collection of some kind. Secondly, Aristotle does not seem to have thought that anger necessarily involves a recognition of right and wrong such as can only be found in a rational being, i.e., (in practice) an adult human; he says in one place that anger is concerned with a perceived wrong (ἐπὶ φαινομένη ὀδίκῃ), but elsewhere he defines it as a "desire to inflict hurt for hurt" (ὄρεξις ἀντιλυπήσεως, *De an.* 403a30; cf. *EN* 1149b20, *Rhet.* 1378a31), without using any morally loaded term, and he generally emphasises its irrational roots, even in humans.

¹⁴ Bocheński (1947) 125. This question is discussed at greater length by P. Huby elsewhere in this volume.

III

Simplicius refers to Eudemus as the “truest of Aristotle’s followers” (fr. 59W), and our survey of his fragments has borne him out. His departure from Athens was not due to pique, like that of some near contemporaries in the Acad my, and relations between him and Theophrastus remained friendly (fr. 6W). His teaching followed Aristotle’s faithfully, with only minor changes nearly all of which were shared by Theophrastus. He also seems to have taken some part in the huge task of putting Aristotle’s school treatises into a form in which they could be used by ordinary readers—I hesitate to speak of an “edition” at this stage of the work—although, as usual, the details are very obscure. We can dismiss the story that he advised Aristotle against publishing the *Metaphysics* (fr. 3W): it has an embarrassing parallel in the (forged) letter in which Alexander the Great reproves Aristotle for publishing this work,¹⁵ and its presupposition, that Eudemus left Athens before Aristotle’s death, although not impossible, is unlikely. But the case for the *Physics* is much stronger. In the form in which we have it, this work consists of several blocks: Books 1, 2–4, 5 + 6 + 8, 7. These blocks are listed under separate titles in the Hellenistic catalogues of Aristotle’s writings and Aristotle himself mostly refers to the first four books as τὰ φυσικά and to Books 5, 6, 8 as τὰ περὶ κινήσεως.¹⁶ They were put together to form the extant version (with Book 7 intercalated between Books 6 and 8) by Andronicus in the first century BC, and this version appears as Φυσικὴ ἀκρόασις η΄ in the post-Andronicean catalogues (Ptolemy and the appendix to Hesychius’ list). But Eudemus used the same set of texts, without our Book 7, as the basis of the *Physika*. He must therefore have anticipated Andronicus in selecting these treatises and making them into a single whole; and since Andronicus appears to have been the first writer with a detailed knowledge of his work, he probably followed Eudemus’ lead when compiling the Φυσικὴ ἀκρόασις.¹⁷ Eudemus’ choice of texts will have been

¹⁵ Printed as Arist. *Epist.* 1 Plezia.

¹⁶ See Moraux (1951) 104f., 197, 252; Ross (1955) 1ff. Aristotle’s usage is not entirely consistent, but these are the titles he uses most often.

¹⁷ If this is correct, it would confirm that Books 5, 6, and 8 were originally a consecutive series, probably identical with the Περὶ κινήσεως in three books listed by D.L. (5.26) and Book 7 was inserted by Andronicus. Eudemus did not “exceptionally diverge from . . . his master’s work, declining . . . to copy this book,” as Wardy would

based on his experience of Aristotle's lectures, but was not inevitable. Theophrastus' *Physika* included his *Περὶ οὐρανοῦ* and *Περὶ τῆς ψυχῆς*, but his *Περὶ κινήσεως* is always cited as a separate work.¹⁸

This difference reflects a difference in their approach to Aristotle. Theophrastus, we are told (72A FHS&G), was selective in his choice of subject-matter, touching lightly on those topics on which Aristotle had said all there was to say and concentrating on the ones whose treatment Aristotle had left incomplete. For him Aristotelianism was a living organism, capable of further development, but always on the lines laid down by its creator. Eudemus preferred to expound Aristotle's philosophy, point by point, as a completed system (fr. 98W). This led to another difference. A notable feature of Theophrastus' writings is his penchant for raising questions (*aporiai*), some of which might appear to cast doubt on some of Aristotle's doctrines, although he usually does not go on to adopt the changes they imply. We do not find this in Eudemus' fragments; when he asks a question, its purpose is to clarify Aristotle's teaching, not to suggest that it might need to be modified (e.g., fr. 67, 103). As Wehrli and others have pointed out, Eudemus' approach anticipates that of the later commentators, and Simplicius occasionally cites him in order to refute Alexander's interpretation of Aristotle (fr. 107), as if he were a commentator of the same kind. The contrast between Theophrastus and Eudemus can be illustrated by the debate about Aristotle's definition of place: Theophrastus raised a number of objections to this, but ended by retaining it, with one modification which did not affect its substance (see below); Eudemus agreed with Theophrastus, but does not even seem to have queried Aristotle's account. Later Strato abandoned it in favour of one which met Theophrastus' criticism (Simpl. *In Phys.* 604.5–11, 606.32–5, 618.20–5 = Theophr. 146 FHS&G, Eud. fr. 79W, Strato fr. 60W).

Other peculiarities which have been noted in Eudemus' work, follow from his general approach. Wehrli sums them up by saying that his account was often tauter and more systematic than Aristotle's, using these terms with reference both to his doctrine and the style of his ex-

have it (1990, 85f.). He did not know it as part of the *Περὶ κινήσεως* and may not have known it at all.

¹⁸ Simpl. *In Phys.* passim (see the index, 1447a); Them. *In Phys.* 108.11. Modern scholars have tried to fit his *Περὶ κινήσεως* into his *Physika* (e.g., Regenbogen [1940] 1397; Steinmetz [1964] 10ff.); they may well be right, but there is no warrant for this in the ancient citations.

position. But these are really different matters. An example of the first is the introduction of the *in peiorem* rule in modal logic. This is a simplification, inasmuch as it makes it possible to read off the modal value of the conclusion from that of the premisses, and it makes the theory more systematic because an *in peiorem* rule applies to assertoric syllogisms with a negative or particular premiss.¹⁹ An example of the second is a change to which I have alluded already. Aristotle began his discussion of place by enumerating six assumptions²⁰ which are commonly made about it, and worked out a definition designed to meet them all (212a6). In the subsequent discussion he found that place must also be unmoved and revised his original definition by adding the word ἀκίνητος (212a20). Eudemus (and Theophrastus) will have accepted the second definition, although Simplicius does not say so explicitly; what he says is that both added an extra assumption, that place is unmoved, to the six laid down by Aristotle at the start. Here we do not have a change of doctrine but of presentation, which makes for a tauter, more systematic exposition. But it is not due only to Eudemus' personal preference. Aristotle's *pragmateiai* have an exploratory character; they show us Aristotle thinking aloud, and his ideas develop as they proceed. By the time Eudemus gave his lectures, Aristotle's main doctrines had been firmly established, and his task was to state them economically and in a way that was easy to follow; his lectures were the equivalent of modern textbooks. No doubt this is the reason why his *Physika* was shorter than Aristotle's, in spite of the leisurely style he sometimes used,²¹ and why he found room for some trivial explanations (e.g., fr. 119) and elementary verbal distinctions (see p. 31, above).

Thus many of the characteristic features of Eudemus' writings can be connected with the circumstances in which they were composed. Of truly personal traits, apart, of course, from his choice of work to do, I have only been able to identify two. One of these I have mentioned already, his interest in language and usage, which seems to have been something wider than Aristotle's interest in πολλαχῶς λεγόμενα. The other is his interest in the history of philosophy, which seems to have occupied much more space, proportionately, in his *Physika* (fr. 31–

¹⁹ See esp. fr. 11c, with Wehrli's note.

²⁰ ἀξιώματα, Simpl. 604.12, etc.; Aristotle does not use the noun, but the verb ἀξιοῦμεν (210b34).

²¹ See Wehrli's note on fr. 31–123 (1969, 88). Eudemus' approach to Aristotle's *Physics* has been discussed in detail by Sharples in this volume.

45W) than in Aristotle's *Physics*. In part this may be due to our sources, but even so the disproportion is striking. It looks as if Eudemus was using these lectures as a general introduction to philosophy.

You may find this conclusion disappointing. Eudemus turns out to have been a worthy professor battling to instill the rudiments of Aristotelian philosophy into an undistinguished group of students. But although he did little himself to develop that philosophy, he wrote some books which were still found useful several centuries after his death and, above all, he helped to start the process of editing Aristotle's school treatises which saved them from oblivion and ultimately made them available to the world. Perhaps this is as much as most of us can hope for.

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3

Qualche Aspetto Controverso della Biografia di Eudemo di Rodi

Tiziano Dorandi

I

La tradizione antica è estremamente scarsa di notizie sulla biografia di Eudemo di Rodi. Nella raccolta di Wehrli sono riunite solo sei testimonianze biografiche dalle quali ben poco si ricava sulle vicende della vita del peripatetico.¹ A questo dato di fatto si aggiunge quello dell'incertezza dell'identificazione dell'Eudemo cui Aristotele indirizzò l'elegia nota come "Elegia dell'altare": Eudemo di Rodi o Eudemo di Cipro, anche lui discepolo di Aristotele e dedicatario del dialogo intitolato *Eudemo o su l'anima*?

Non ho trovato nuove testimonianze in aggiunta a quelle raccolte da Wehrli né tutte meritano di essere nuovamente analizzate. Mi soffermo pertanto su quelle che presentano ancora aspetti controversi: in alcuni casi, infatti, la critica recente ne ha chiarito qualche dettaglio o messo in evidenza qualche elemento significativo. I risultati sono importanti non solo limitatamente alla biografia di Eudemo, ma anche per la storia del Peripato più antico.

¹ Wehrli (1969, fr. 1–6), con il commento alle pagine 77–79.

Nella prima parte del mio contributo vorrei raccogliere, per così dire, il materiale per un eventuale futuro commento alla sezione “biografica” della raccolta di Wehrli. Nella seconda, riprendo il problema della identificazione dell’Eudemo cui Aristotele aveva inviato i versi dell’“Elegia dell’altare.” Discuto, infine, della possibilità di attribuire a Eudemo di Rodi un’opera sulla storia della città di Lindos nell’isola di Rodi (Λινδιακὸς [λόγος]).

II

Innanzitutto il poco che conosciamo di sicuro della vita di Eudemo.² Non si conserva nessuna vita antica di Eudemo di Rodi; sappiamo, tuttavia, che un certo Damas ne aveva scritta una, oggi perduta (fr. 1). Diogene Laerzio cita Eudemo due volte nel primo libro delle *Vite dei filosofi*,³ ma non gli consacra una vera e propria biografia fra i filosofi peripatetici nel quinto libro. In 1.9, a proposito dei Magi, Diogene dice che Eudemo, come Teopompo nell’ottavo libro delle *Filippiche*,⁴ sosteneva che: “Secondo i Magi gli uomini vivranno di nuovo e saranno immortali e che gli esseri perdureranno grazie alle loro invocazioni.” In 1.23, riferisce che nella sua *Storia dell’astronomia*, Eudemo scriveva che Talete sembrava: “Essere stato il primo a essersi dedicato all’astronomia e a avere predetto le eclissi solari e i solstizi.”

Eudemo era originario dell’isola di Rodi (fr. 2). Wehrli⁵ colloca la data di nascita del filosofo prima del 350 a.C.: Eudemo infatti era stato preso in considerazione come successore di Aristotele a capo del Liceo, il che lascia supporre che nel 322/1 doveva avere almeno una trentina d’anni. Dopo che la scelta era caduta su Teofrasto (Aristotele aveva espresso discretamente la sua preferenza per il filosofo di Ereso, come si ricava dall’aneddoto riferito da Aulo Gellio⁶), Eudemo era ritornato a Rodi⁷ dove aveva aperto una scuola stabilendo così una solida

² L’articolo di Martini (1907, cols. 895–97) resta tuttora valido.

³ 1.9 et 23 = fr. 89 e 144W.

⁴ *FGrHist* 115F64.

⁵ Wehrli (1968) cols. 652–53 e Id. (1983) 530.

⁶ *Noctes Atticae* 13.5 = fr. 5: *Utrumque* (sc. *uinum Rhodium et Lesbium*), *inquit, oppido bonum, sed ἡδίων ὁ Ἑσβιος*.

⁷ Zeller (1921, 869 n. 4 = Zeller–Mondolfo [1966] 442 n. 1), suppone che Eudemo restò a Atene ancora qualche anno dopo l’elezione di Teofrasto a scolarca (lo segue Martini [1907] col. 896). Cf. Moraux (1973) 9 n. 17.

tradizione peripatetica nell'isola. Questo consente di spiegare l'esistenza di giovani peripatetici formati apparentemente a Rodi: Prassifane di Mitilene (?), Ieronimo e Andronico di Rodi.⁸

Eudemo ebbe un fratello chiamato Boeto, al cui figlio Pasicle fu attribuito il libro *Alpha Meizon* della *Metafisica* di Aristotele (fr. 4). Dopo il suo rientro a Rodi, Eudemo sembra restasse in contatto epistolare con Teofrasto (fr. 6). Era conosciuto nell'antichità come il più aristotelico dei discepoli di Aristotele.⁹

III

I frammenti biografici che presentano ancora alcuni punti controversi o dubbi sono essenzialmente il fr. 1 (da considerare insieme con il fr. 6) e i fr. 3–4.

III.1. Il fr. 1 e il fr. 6 sono tratti dal proemio al *Commentario* di Simplicio al 6 libro della *Fisica* di Aristotele.¹⁰ Nelle pagine di Simplicio, il fr. 6 precede il fr. 1: è in questo ordine che intendo leggere i due frammenti rispettando la loro successione e il contesto.

Simplicio riprende (fr. 6) la questione, largamente dibattuta nella tarda antichità, della divisione della nostra *Fisica* in due parti.¹¹ Porfirio e pochi altri ponevano la cesura dopo il libro 4; la maggioranza dei critici, dopo il libro 5 (E). Questa è la posizione difesa anche da Simplicio, il quale condivide la posizione dei “Peripatetici” che il libro che sta commentando è il sesto della serie (Z), ma nota che solo i cinque libri precedenti possono essere propriamente intitolati Φυσικά e che i libri Z–Θ costituiscono un'opera distinta Περὶ κινήσεως.¹²

Si è già detto che essi chiamano i cinque libri che precedono questo *Fisica* (Φυσικά) e i tre seguenti *Sul movimento* (Περὶ κινήσεως). È così che li ordina Andronico nel terzo dei libri su Aristotele. Anche Teofrasto lo attesta per quanto riguarda i primi cinque libri quando Eudemo gli scrive a proposito di uno dei suoi manoscritti corrotti del quinto libro: “Circa il passo dei libri della *Fisica*

⁸ Wehrli (1969) 78 e Id. (1968) col. 653.

⁹ Cf. Simpl., *In phys.* (CAG 9, p. 133, 21 e p. 411, 16 Diels).

¹⁰ L'intero proemio (CAG 10, p. 923.3–925.2 Diels) è tradotto in inglese e annotato da Barnes (1997, 67–69). La mia traduzione tiene conto di alcuni suggerimenti esegetici e testuali di Barnes.

¹¹ Cf. Brunschwig (1991) 28–31.

¹² Cf. Barnes (1997) 34–35.

a proposito del quale nella tua lettera mi chiedi di scriverti e di risponderti, o non lo capisco oppure c'è una differenza certamente piccola rispetto a:¹³ 'E quest'ultimo è l'unico caso di immobilità che io chiamo quiete; infatti la quiete è contraria al movimento, sicché essa è, per così dire, una privazione presente in ciò che può accogliere il moto'.¹⁴ Ne risulta che Teofrasto considerava il quinto libro come facente parte della *Fisica* (ἐκ τῶν Φυσικῶν).¹⁵

Simplicio riporta di seguito alcuni luoghi della *Fisica* e del *Cielo* dai quali ritiene si possa ricavare che Aristotele stesso chiamava i primi cinque libri della nostra *Fisica* Φυσικά e gli ultimi tre Περὶ κινήσεως.¹⁶ Viene infine l'attuale fr. 1:

Che i tre (libri) siano *Sul movimento* (Περὶ κινήσεως) e i cinque *Fisica* (Φυσικά) lo attesta anche Damas, l'autore di una vita di Eudemo, quando scrive: "E del trattato *Sulla natura* (Περὶ φύσεως) di Aristotele, i tre libri *Sul movimento* (Περὶ κινήσεως)."

Simplicio conclude il suo proemio¹⁷ con alcune osservazioni sulla successione dei libri della *Fisica* e riferisce gli argomenti di Eudemo (fr. 98) e di Andronico a conferma che l'attuale libro sesto era correttamente collocato dopo il quinto.

I due frammenti non illuminano molto sulla vita di Eudemo. Si ricava che un certo Damas aveva scritto un *Bios* di Eudemo; che Eudemo, pur dopo l'elezione di Teofrasto a scolarca del Liceo e la sua partenza per Rodi, aveva mantenuto buoni rapporti con quest'ultimo; che aveva intrattenuto con lui un carteggio e soprattutto che aveva portato con sé a Rodi una copia della *Fisica* di Aristotele.¹⁸ Il passo ha piuttosto attirato l'attenzione degli studiosi per il contributo che sembrerebbe apportare alla definizione del metodo di lavoro e alla valutazione dell'attività "editoriale" di Andronico sulla *Fisica* di Aristotele.¹⁹ È

¹³ La frase ἢ μικρόν τι παντελῶς ἔχει τὸ ἀνὰ μέσον non è chiara: Barnes (1997, 68 n. 286) la considera corrotta e traduce: "or else it hardly differs from."

¹⁴ *Phys.* 5.2 226b14–16 quale trasmesso dai MSS. conservati: ὅπερ ἡρεμεῖν καλῶ τῶν ἀκινήτων μόνον· ἐναντίον γὰρ ἡρεμία κινήσει, ὥστε στέρησις ἂν εἴη τοῦ δεκτικοῦ. Sul probabile senso di questo passo, cf. Barnes (1997) 68 n. 287.

¹⁵ Simpl., *In phys.* 6, proem. (CAG 10, p. 923.7–16 Diels) = Theophr. fr. 157 FHS&G.

¹⁶ Simpl., *In phys.* 6, proem. (CAG 10, p. 923.16–924.12 Diels).

¹⁷ Pp. 924.16–925.2.

¹⁸ Dubita di queste conclusioni Barnes (1997, 60 e 67 n. 284) per il quale la lettera può essere un falso.

¹⁹ Su Andronico rimando solo a Barnes (1997).

stato supposto che Andronico è la fonte alla quale Simplicio attinse verisimilmente tutte le informazioni che leggiamo in questo proemio, ivi compresi gli estratti dalla *Vita di Eudemo* di Damas e dalla lettera di Teofrasto.²⁰ Recentemente, Barnes ha giudicato questa ricostruzione una “fantasia”: non ci sono infatti elementi, afferma, a favore dell’ipotesi che qui Simplicio citi Andronico né che le informazioni relative a Damas e a Teofrasto gli derivino da quest’ultimo.²¹ Una ben più importante conclusione è, invece, possibile dedurre dal testo del commentatore neoplatonico: Simplicio vi sostiene che per Andronico i primi cinque libri della nostra *Fisica* (A–E) formano una unità (Φυσικά) e gli ultimi tre (Z–Θ) un’altra unità (Περὶ κινήσεως); Andronico riteneva inoltre che il libro Z della nostra *Fisica* (il suo Περὶ κινήσεως A) seguiva immediatamente il libro E della nostra *Fisica* (il suo Φυσικά E). La lettura del proemio di Simplicio porta dunque a credere, conclude Barnes, che Andronico non considerava la nostra *Fisica* come un’opera unitaria; in ogni caso, Simplicio non dice niente a proposito di un tentativo di Andronico di riunire sotto un titolo comune i suoi Φυσικά e il suo Περὶ κινήσεως in modo da formare quell’unità che è la nostra *Fisica*. Ne consegue pertanto che la nostra *Fisica* è un *patchwork* non di Andronico, ma di Aristotele stesso.²²

III.2. Il tema del mio intervento mi porta a soffermarmi, in particolare, sull’identità di Damas,²³ ancora oscura.²⁴ Il nostro personaggio è menzionato solo nel passo di Simplicio. Wehrli suppone che Damas fosse allievo di Eudemo.²⁵ I suoi argomenti non sono smentiti dall’analisi del passo di Simplicio dal quale si deduce che la copia della *Fisica* di Aristotele che Eudemo possedeva conteneva anche il 7 libro (H): Eudemo aveva questo libro, ma non era interessato al suo contenuto perché lo considerava superfluo rispetto al libro 8 (Θ).²⁶ Impossibile l’identificazione con il retore d’età augustea Damas di Tralle. Altresì da escludere è la proposta di correggerne il nome e di

²⁰ Cf. Moraux (1973) 115–16.

²¹ Barnes (1997) 35–36.

²² Barnes (1997) 36 riprendendo una suggestione di Brunschwig (1991) 34.

²³ La forma corretta del nome Δάμας (e non Δάμασος come stampava Chr. Brandis (1836, 404b 34) è restituita da Diels (CAG 10, p. 924 ad loc.).

²⁴ Cf. Hoffmann (1994a).

²⁵ Wehrli (1969) 77.

²⁶ Cf. Brunschwig (1991) 27; Barnes (1997) 61.

vedere in Δάμος una deformazione del nome di Damascio (Δαμάσκιος),²⁷ con l'ulteriore inferenza che Damascio sarebbe stato autore anche di una *Vita di Aristotele* e di una *Vita di Eudemo* oggi perdute.²⁸

IV

I fr. 3–4 sono estratti dal Commentario di Asclepio alla *Metafisica* di Aristotele e devono essere anch'essi considerati insieme.

IV.1. Nel primo,²⁹ Asclepio discute la struttura e le caratteristiche formali della *Metafisica*, che si distinguono da quelle degli altri trattati (πραγματεῖαι). Tra gli argomenti addotti dai critici antichi a giustificare queste peculiarità, Asclepio riferisce il seguente:

(Aristotele), dopo avere scritto questo trattato, lo inviò al proprio discepolo Eudemo di Rodi, il quale non ritenne opportuno rendere di pubblico dominio un così grande trattato (ἐκδοθῆναι εἰς πολλοὺς τηλικαύτην πραγματείαν). Nel frattempo, Aristotele morì e alcune parti dell'opera andarono perdute. I successori (οἱ μεταγενέστεροι) non osando aggiungerci niente di proprio ... la completarono utilizzando materiale derivato dagli altri trattati e adattandolo come era possibile.

Per Wehrli, la testimonianza non è del tutto credibile.³⁰ Essa presupporrebbe infatti che Eudemo fosse tornato a Rodi prima della morte di Aristotele; e, d'altronde, sembra strano che Aristotele, alla fine della sua vita, avesse inviato una copia della *Metafisica* al suo giovane allievo a Rodi senza conservarne una copia presso di sé.

La storicità del racconto ha difeso Berti³¹ per il quale non ha grande importanza sapere dove era Eudemo alla morte di Aristotele né se Aristotele gli aveva inviato un esemplare della *Metafisica* oppure se Eudemo l'aveva portata con sé a Rodi, dopo al morte del maestro. Quello che la testimonianza di Asclepio mette bene in evidenza è il fatto che Eudemo aveva con sé a Rodi una copia della *Metafisica*; e Asclepio si fonda certamente su una fonte più antica.

²⁷ Suggesta da Jonsius (1659, 4:253) seguito da Lobeck (1829, 1.339).

²⁸ Ruelle (1861) 156–57 (= 68–69). Cf. Martini (1907) col. 896 e Hoffmann (1994b) 570.

²⁹ Asclep., *In metaph.* 1.1 (CAG 6.2, p. 4.4–15 Hayduck).

³⁰ Wehrli (1969) 78.

³¹ Berti (1982) 17. Cf. Moraux (1973) 8–10.

Si deve escludere che Eudemo avesse preparato lui stesso una “edizione” della *Metafisica*, come sembra pensare lo pseudo-Alessandro di Afrodisia³² e come ha cercato di giustificare Reiner. Questo studioso si sforza di dimostrare che il titolo *Metafisica* non fu dato a quel complesso di libri, per la prima volta, da Andronico di Rodi al fine di indicare che quel trattato veniva subito dopo le opere di fisica (τὰ μετὰ φυσικά, sc. βιβλία).³³ Reiner parte da una idea di Moraux,³⁴ secondo cui il titolo *Metafisica* non deriverebbe dalla posizione dell’opera nella successione dei libri aristotelici, ma da considerazioni di ordine didattico, quali presupposte da Alessandro di Afrodisia e da Asclepio.³⁵ La sua conclusione è che il titolo *Metafisica* rifletteva la dottrina aristotelica che si deve partire dallo studio delle cose più note per passare poi allo studio delle cose più intellegibili; esso risalirebbe, dunque, a molto prima di Andronico, probabilmente a Eudemo che sarebbe stato, pertanto, il primo “editore” in assoluto di quel trattato.³⁶ Barnes ritiene che non ci sono elementi a favore di una “edizione” della *Metafisica* curata da Eudemo o da Andronico.³⁷ Ma per quanto riguarda l’intervento di Andronico nella redazione della nostra *Metafisica* bisogna tener conto anche della testimonianza del fr. 4 di Eudemo e di uno scolio pagirino di cui non è menzione nelle pagine di Barnes.

IV.2. Nel fr. 4 è rilevante la questione relativa a Pasicle, il figlio del fratello di Eudemo, Boeto:³⁸

Bisogna dunque sapere che Aristotele scrisse quattordici libri nel presente trattato (sc. la *Metafisica*). Scrisse infatti fino alla lettera *ny* compresa. Ma altri critici sostenevano che i libri fossero tredici. Dicono infatti che *Alpha Meizon* ... non era di Aristotele, ma di Pasicle, figlio di Boeto, fratello di Eudemo il suo allievo. Il che non è vero.

³² Ps.-Alex., *In metaph.* 6.11 (CAG 1, p. 515.3–11 Hayduck) = fr. 124. Cf. Moraux (1973) 10 n. 18. Per Barnes (1997, 62), Asclepio, se non dice, suggerisce almeno che Eudemo fu il primo “editore” della *Metafisica*.

³³ Reiner (1954) e (1955).

³⁴ Moraux (1951) 315.

³⁵ Alex., *In metaph.* 2.1 (CAG 1, p. 171.5–7 Hayduck) e Asclep., *In metaph.* 1.1 (CAG 6.2, p. 1.12–22 Hayduck).

³⁶ *Contra Düring* (1968) cols. 272–73; Routila (1969) 18–23; Berti (1982) 31–32.

³⁷ Barnes (1997) 61–63.

³⁸ Asclep., *In metaph.* 1.1 (CAG 6.2, p. 4.18–22 Hayduck). Un profilo di Pasicle, insufficiente, ha tracciato Brink (1949).

Questo passo va letto insieme con uno scolio trasmesso dal cod. E (*Paris. gr.* 1853, f. 243^r) della *Metafisica*:

τοῦτο τὸ βιβλίον οἱ πλείους φασὶν εἶναι Πασικλέους τοῦ Ῥοδίου, ὃς ἦν ἀκροατὴς Ἀριστοτέλους υἱὸς δὲ Βοηθοῦ τοῦ Εὐδήμου ἀδελφοῦ. Ἀλέξανδρος δὲ ὁ Ἀφροδισιεύς φησι εἶναι αὐτὸ Ἀριστοτέλους.

La maggior parte dei critici dice che questo libro è di Pasicle di Rodi, allievo di Aristotele e figlio di Boeto, il fratello di Eudemo. Ma Alessandro d'Afrodisia dice che è di Aristotele.

L'interpretazione dello scolio e in particolare di τοῦτο τὸ βιβλίον (si riferisce a *Alpha Meizon* o a *Alpha Elatton* della *Metafisica*?) aveva dato origine a una lunga controversia oggi conclusa grazie alle ricerche di Berti, Bernardinello e della Vuillemin-Diem.³⁹

Un riesame del cod. E ha consentito infatti di determinare con sicurezza che quello scolio è relativo a *Alpha Meizon* e non a *Alpha Elatton* e che quindi τοῦτο τὸ βιβλίον, di cui sarebbe autore Pasicle, indica *Alpha Meizon*, come già nel Commentario di Asclepio (fr. 4), da cui fu probabilmente estrapolato. La “maggior parte dei critici” (οἱ πλείους) che, in contrasto con Alessandro di Afrodisia, attribuivano la paternità di quel libro a Pasicle possono essere identificati con commentatori che si erano occupati della *Metafisica* prima di Alessandro, forse con lo stesso Andronico di Rodi. Non si deve, infine, tenere conto dell'altro scolio, simile per molti aspetti al precedente e contenuto nella stessa pagina del manoscritto parigino. Questo scolio, pubblicato per la prima volta dal Brandis (1836), e nel quale τοῦτο τὸ βιβλίον è esplicitamente identificato con *Alpha Elatton*, risale, come ha dimostrato Bernardinello, alla metà/fine del XIV sec.⁴⁰ Il suo anonimo autore presuppone lo scolio precedente e può essere considerato come colui che, per primo, riferì il contenuto anche di questo a *Alpha Elatton* e non a *Alpha Meizon* dando così origine a tutta la serie di fraintendimenti, ora fortunatamente eliminati.

³⁹ Berti (1982); Bernardinello (1982) e Vuillemin-Diem (1983); cf. Moraux (1986) 138–40 con le note alle pagine 146–47.

⁴⁰ Il testo di questo secondo scolio è ripubblicato, sulla base di una rinnovata collazione di E, da Bernardinello (1982, 50–51). I suoi risultati sono condivisi da Berti (1982, 15–16).

IV.3. A partire da questi nuovi dati si è cercato di ricostruire la storia di Pasicle e di definire il ruolo avuto da Eudemo nella storia della tradizione antica della *Fisica* e della *Metafisica* aristoteliche. Eudemo, al momento del suo rientro a Rodi, aveva portato con sé una copia della *Fisica* e probabilmente anche una della *Metafisica*.⁴¹ Si trattava non di “edizioni,” ma piuttosto di copie a uso privato di quegli scritti.⁴² Il deterioramento del manoscritto della *Metafisica* e l'intervento dei successori (οἱ μεταγενέστεροι del fr. 3) poté essersi verificato nella copia dell'opera conservata a Rodi. Tra questi interventi non è da escludere ci fosse l'inserimento del libro *Alpha Elatton*, che non apparteneva alla *Metafisica*, ma si trovava fra le opere di Aristotele. Andronico, avendo davanti a sé una copia della *Metafisica* con due libri primi, proveniente da Rodi, aveva ritenuto che uno dei due, e cioè *Alpha Meizon*, non fosse di Aristotele e lo aveva attribuito a Pasicle. Questa l'ipotesi di Berti, che così la giustifica:⁴³ È probabile che Asclepio, che conosceva l'attribuzione di *Alpha Meizon* a Pasicle, avesse attinto questa notizia a Andronico di Rodi (a lui risale sicuramente la suddivisione della *Metafisica* in tredici libri di cui è menzione anonima [ἐνιοί] nel fr. 4 e nel catalogo di Tolomeo⁴⁴). Andronico aveva riunito, in vista della sua edizione, raccolte di libri di Aristotele che provenivano da diverse tradizioni (di Atene, di Rodi, di Alessandria). Tra queste, l'unica che conteneva la *Metafisica* era quella di Rodi, che faceva capo a Eudemo. Questa *Metafisica* doveva comprendere sia *Alpha Meizon* (che costituiva la vera premessa scritta da Aristotele per il nucleo centrale dei libri del trattato, e cioè ΒΓΕΖΗΘ) sia *Alpha Elatton*, che Aristotele aveva scritto in un periodo antecedente come introduzione a un corso di filosofia comprendente fisica e metafisica. Se si crede alla storia dell'intervento dei “successori” (οἱ μεταγενέστεροι) raccontata da Asclepio, a loro può essere imputata l'aggiunta di *Alpha Elatton* al *corpus* della *Metafisica*. Andronico, trovatosi tra le mani due primi libri, atetizzò *Alpha Meizon* che attribuì a Pasicle di Rodi. La scelta di Andronico non ebbe successo e la paternità aristotelica dei entrambi i libri è fuori di dubbio.⁴⁵

⁴¹ Moraux (1973) 8–10. Cf. Tarán (1981) 725.

⁴² Cf. Birt (1882) 458 n. 1.

⁴³ Berti (1982) 18–21.

⁴⁴ Düring (1957) 226 no. 56.

⁴⁵ Cf. Berti (1982) 21–37.

V

Il discorso fin qui condotto a proposito della *Metafisica* richiama quello relativo all'attribuzione a Eudemo di Rodi della così detta *Etica Eudemea*,⁴⁶ condivisa, fra gli altri, da Zeller che riportava la sua esposizione di quello scritto nel capitolo dedicato al peripatetico di Rodi.⁴⁷ La moderna critica è, tuttavia, d'accordo nel confermare la paternità aristotelica anche dell'*Etica Eudemea*.⁴⁸

V.1. L'unica testimonianza antica che attribuisce quell'*Etica* a Eudemo si trova nel Commento di Aspasio all'*Etica Nicomachea*.

Nel corso della sua discussione sulla trattazione del piacere in 7.14, 1153b9–13, Aspasio scrive:⁴⁹

Da queste parole sembra dunque che (Aristotele) voglia dimostrare che il bene e il piacere sono la medesima cosa. Non è certo così, ma al contrario ... egli argomenta secondo l'opinione comune (ἐνδόξως) che il piacere è ciò che c'è di meglio; poiché nei libri a Nicomaco (ἐν τοῖς Νικομαχείοις), là dove anche analizza il piacere, Aristotele dice chiaramente che quello non è identico alla felicità, ma che è “come la bellezza per quelli che sono nel fiore dell'età” (*EN* 10.4 1174b33). E un indizio che quanto precede (τοῦτο) non è di Aristotele, ma di Eudemo lo fornisce il fatto che l'autore nel <decimo libro>⁵⁰ parla del piacere come se non avesse ancora trattato di questo tema. Al di là del fatto che questi argomenti siano di Eudemo o di Aristotele, sono trattati secondo l'opinione comune (ἐνδόξως).⁵¹

La pagina di Aspasio è interessante soprattutto per la dibattuta questione dei cosiddetti libri “controversi,” dei libri comuni cioè sia all'*Etica Nicomachea* sia all'*Etica Eudemea* (i libri ΔΕΖ dell'*EE* sono uguali ai libri ΕΖΗ dell'*EN*). Poiché Aspasio rimanda alla trattazione

⁴⁶ Insostenibile l'ipotesi che si tratti di Eudemo di Cipro, come pensava Dirlmeier (1962, 1979, 109) e ancora Décarie (1978, 30).

⁴⁷ Zeller (1921) 874–81 = Zeller–Mondolfo (1966) 449–56.

⁴⁸ Uno *status quaestionis* presentano A. Plebe, in Zeller–Mondolfo (1966) 88–110 e Flashar (1983) 242–44.

⁴⁹ Aspasio, *In eth. Nicom.* 7.14 (CAG 19.1, p. 151.18–26 Heylbut). Il passo non è stato raccolto dal Wehrli.

⁵⁰ Per l'integrazione, già suggerita da Heylbut, cf. Moraux (1984) 258 n. 104. Ne dubita Barnes (1999, 20 n. 59).

⁵¹ Bibliografia recente: Harlfinger (1971) 45–47; Bodéüs (1973); Moraux (1984) 257–61; Gottschalk (1987) 1101 n. 112, 1158 (= 68 n. 69); Kenny (1978) 29–37; Mercken (1990) 440.

del tema del piacere nel decimo libro dell'*EN* e non a quella esposta nel libro H della medesima opera, ne è stato dedotto che il Commentatore considerava i capitoli sul piacere nel settimo libro non di Aristotele, ma di Eudemo di Rodi cui attribuiva la paternità dell'*EE*.

Due sono le interpretazioni correnti, e in contrasto, della testimonianza di Aspasio, un ostacolo alla cui comprensione è, senza dubbio, costituito dal fatto che del Commento di Aspasio si conservano solo le sezioni relative ai libri A-Δ, H e parte di Θ dell'*EN* (secondo l'ordine delle moderne edizioni del trattato aristotelico).⁵²

Per Kenny,⁵³ è probabile che l'edizione dell'*EN* commentata da Aspasio non comprendesse i libri "controversi", ma fosse limitata ai libri A-Δ e Θ-K. Il commentatore era a conoscenza, tuttavia, di edizioni dell'*EE*, che contenevano quei tre libri; a causa del titolo, riteneva, comunque, che l'autore dell'opera fosse Eudemo di Rodi. Per colmare la lacuna dell'*EN*, Aspasio, dopo aver trattato dei libri A-Δ, sarebbe passato a commentare i libri Δ-Z dell'*EE* riuscendo così a organizzare un commentario completo dell'intero sistema etico aristotelico. Una conferma a questa ipotesi è possibile trovare in un passo del Commentario di Aspasio al libro Θ dell'*EN*. A proposito delle critiche che Aristotele muove in *EN* 8.2 1155b13-16 contro coloro che ammettono un solo tipo di amicizia e, in particolare, della frase: "Di ciò abbiamo già parlato prima (ἐμπροσθεν)," Aspasio nota che ἐμπροσθεν fa riferimento a una sezione perduta dell'*EN*: εἴρηται δέ, φησί, περὶ αὐτῶν ἐμπροσθεν, ἔοικε δὲ εἰρησθαι ἐν τοῖς ἐκπεπωκόσι τῶν Νικομαχείων.⁵⁴ Sebbene non si possa essere sicuri—conclude Kenny—che con questa frase Aspasio faccia riferimento alla lacuna rimpiazzata dai libri "controversi," questa resta la soluzione più semplice per intendere quella testimonianza.

Per Gottschalk,⁵⁵ Aspasio trovava nel suo esemplare dell'*EN* anche i libri "controversi" e, per questo motivo, li aveva commentati. Dubitava, comunque, della loro autenticità e supposeva che questi fossero stati sistemati in questo punto dell'*EN* in un momento imprecisabile per rimpiazzarne i libri perduti con altri derivati dall'*EE*, che immaginava essere stata scritta da Eudemo di Rodi.

⁵² Sulla persona e l'opera di Aspasio, cf. Becchi (1994) 5365-96 e Barnes (1999).

⁵³ Kenny (1978) 29-37. Ne accoglie incondizionatamente i risultati Charles (1982, 224-25).

⁵⁴ Aspas., *In eth. Nicom.* 8.2, 1155b13-16 (CAG 19.1, p. 161.9-10 Heylbut).

⁵⁵ Gottschalk (1987) 1101 n. 112, 1158 (= 68 n. 69).

A conclusioni più prudenti è giunto recentemente Barnes⁵⁶ per il quale le precedenti ipotesi costituiscono “a magnetical attractive story” (20) nella quale c’è un fondo di verità, e cioè che l’*Etica Nicomachea* quale la leggiamo oggi è un ibrido. Ma questo fondo di verità non prova che “the rest of the story is true; nor that the rest of the story can and should be read in Aspasius’ text” (21). La traduzione corrente della frase ἐν τοῖς ἐκπεπτωκόσι τῶν Νικομαχείων, “nei libri perduti dell’*Etica Nicomachea*,” è erranea; il participio aggettivale ἐκπεπτωκόσι non è accompagnato da un sostantivo e deve pertanto essere inteso nel senso di “the missing items,” “the items which have dropped out” (19). Quello che Aspasio suppone è che qualcosa è andato perduto nella suo manoscritto oppure (più probabilmente) in tutti i manoscritti dell’*Etica Nicomachea*; ma egli non sa che cosa era contenuto in quelle parti perdute.

Una volta ammessa la paternità aristotelica anche dell’*EE*, resta da spiegare che cosa significhi l’aggettivo *Eudemea*. Da escludere è sia l’opinione che l’*EE* fosse così intitolata perché dedicata da Aristotele a Eudemo, come l’*Etica Nicomachea* sarebbe stata dedicata dal medesimo a suo figlio Nicomaco, sia quella che vede in Eudemo e Nicomaco i nomi dei “redattori” o “editori,” fosse anche a titolo “onorifico,” di quei due trattati etici.⁵⁷

Una buona soluzione avrebbe potuto essere quella di Bodéüs: l’*EN* e l’*EE* altro non sono che due collezioni di *moralia* messe insieme da Andronico di Rodi a partire dai materiali che rimontavano a due tradizioni distinte: quella di Atene (*EN*) e quella di Rodi (*EE*). Se così, il titolo dell’*EE* doveva essere stato inteso da Andronico nel senso di: “Collezione di questioni morali (sc. di Aristotele) secondo Eudemo,” cioè, “conforme alla codificazione fattane da Eudemo.”⁵⁸ La presenza degli aggettivi *Eudemea* e *Nicomachea*, altro non sarebbe che un espediente “editoriale” (di Andronico) per distinguere due raccolte di scritti etici che potevano avere in comune alcune parti (i libri “controversi”?).

I risultati raggiunti da Barnes a proposito della “presunta” attività “editoriale” di Andronico fanno pesare forti sospetti su questa ipotesi. In attesa di nuovi argomenti o documenti che gettino nuova luce su

⁵⁶ Barnes (1999) 19–21.

⁵⁷ Cf. Bodéüs (1973) 465–66.

⁵⁸ Bodéüs (1973) 462–65.

Andronico o sulla storia del testo aristotelico nell'antichità, dobbiamo accontentarci di un insoddisfacente *non liquet*.

VI

Vorrei ora esaminare, seppure brevemente, la questione dell'identità dell'Eudemo dell'elegia di Aristotele nota come "Elegia dell'altare."

Olimpiodoro cita, nel *Commento al Gorgia*,⁵⁹ alcuni versi di una elegia in onore di Platone che Aristotele indirizza a un Eudemo (ἐν τοῖς ἐλεγείοις τοῖς πρὸς Εὐδήμον).⁶⁰

La critica è divisa fra Eudemo di Cipro e Eudemo di Rodi, anche se oggi sembra prevalere la tesi a favore di Eudemo di Rodi.⁶¹ Il dibattito ha riaperto, alcuni anni fa, K. Gaiser⁶² in un articolo che ritengo ancora valido non ostanti le critiche di Theiler.⁶³

Riproduco i versi accompagnati da una traduzione.⁶⁴

ἐλθὼν δ' ἐς κλεινὸν Κερκοπίνης δάπεδον
εὐσεβέως σεμνῆς φιλίας ἰδρύσατο βωμόν
ἄνδρὸς, ὃν οὐδ' αἰνεῖν τοῖσι κακοῖσι θέμις.
ὅς μόνος ἢ πρῶτος θνητῶν κατέδειξεν ἐναργῶς
οἰκείῳ τε βίῳ καὶ μεθόδοισι λόγων,
ὥς ἀγαθὸς τε καὶ εὐδαίμων ἅμα γίνεται ἀνὴρ.
οὐ νῦν δ' ἔστι λαβεῖν οὐδενὶ ταῦτά ποτε.

E quando giunse al nobile suolo della Cecropia piamente eresse un altare in onore della veneranda amicizia di un uomo, che ai cattivi neppure è lecito lodare. Il quale solo, o primo fra i mortali, dimostrò chiaramente con la sua propria vita e con le argomentazioni delle sue dottrine, che l'uomo diviene a un tempo buono e felice; ma a nessuno ormai è concesso di giungere a questo.

⁵⁹ 41.9 (215.2–11 Westerink). Alcuni versi dell'Elegia sono conservati anche nelle *Vite* antiche di Aristotele e nei commentatori (cf. Gaiser [1966] 98 n. 51). Solo Olimpiodoro fa il nome di Eudemo.

⁶⁰ Fr. 673 Rose³ = fr. 1, p. 146 Ross = fr. 608 Gigon = T 3 e F 3 Plezia. La bibliografia è raccolta da Plezia (1977, 5).

⁶¹ Una dossografia dei contributi più recenti in Flashar (1983, 288): a favore di Eudemo di Rodi, in particolare, Jaeger (1923), seguito da Wehrli, Theiler (1966); per Eudemo di Cipro, soprattutto Gaiser.

⁶² Gaiser (1966).

⁶³ Theiler (1966).

⁶³ Ripropongo il testo quale stabilito da Plezia.

⁶⁴ Gaiser (1966) 91.

Gaiser enumera con chiarezza i diversi problemi sia di ordine testuale sia di ordine esegetico che i versi ancora presentano: a) Chi è l'Eudemo cui Aristotele si rivolge? b) In onore di chi venne eretto l'altare: di Platone o della Amicizia (Φιλία) c) Chi è l'ignoto personaggio che giunse a Atene e fondò l'altare? d) Quale era la situazione in cui si trovava Aristotele quando scrisse l'elegia?

Lo studioso dà grande importanza al *vûv* dell'ultimo verso (7: οὐ *vûv* δ' ἔστι λαβεῖν οὐδενὶ ταῦτά ποτε), che, a suo parere, non ha un significato storico-temporale, ma va inteso piuttosto nel senso di: "Ora, nella vita mortale." L'intero verso è così tradotto: "Nicht jetzt in diesem Leben aber ist es irgendeinem jemals möglich, sich dies erkennend anzueignen."⁶⁵ A partire da questa interpretazione, Gaiser sostiene che l'elegia fu scritta durante la vita di Platone e dopo l'assassinio di Dione (354), negli ultimi mesi di vita di Eudemo di Cipro (muore nel 354/3).⁶⁶ I versi erano pertanto diretti all'Eudemo di Cipro e non a quello di Rodi, come presuppone una datazione tarda dell'elegia sostenuta soprattutto da Jaeger.⁶⁷ Il fondatore dell'altare (ll. 1–3) è, pertanto, Dione di Siracusa e non Aristotele.

Contro l'ipotesi di Gaiser replicò immediatamente Theiler.⁶⁸ Lo studioso respinse, per motivi linguistici, l'interpretazione del *vûv* e ritornò alla tesi che l'elegia era indirizzata a Eudemo di Rodi nel quale, e non in Dione, individuava colui che aveva fondato l'altare.

L'accettazione delle critiche di Theiler comporta, purtroppo, due interventi sul testo trådito dell'elegia: al v. 7, Theiler è costretto a congetturare οὐ *vûv* δ' ἔστι λαβεῖν οὐδενὶ ταῦτ' ἄπορον invece di οὐ *vûv* δ' ἔστι λαβεῖν οὐδενὶ ταῦτά ποτε; al v. 2, la rinuncia a Dione quale dedicatario dell'altare si fonda sulla correzione di ἰδρύσατο in ἰδρύσας proposta dubbiosamente da Bergk e da Rose.⁶⁹

⁶⁵ Gaiser (1966) 91.

⁶⁶ La cronologia di Eudemo di Cipro è stata ricostruita da Spoerri (1966). Cf. Gaiser (1966) 102 n. 62.

⁶⁷ Dopo la morte di Platone, nel 348/7: Jaeger (1923) 106–11 e Id. (1927 = 1960). Una datazione ancora più tarda, al 335/4, propone Düring (1957) 315–18 e Id. (1966) 15–16 e 52.

⁶⁸ Critiche, per quanto riguarda l'interpretazione del *vûv* nell'ultimo verso, sono state mosse anche da Chroust (1973, 2.315–16 n. 63).

⁶⁹ Bergk (1882) 337 e Rose (1863) 601: entrambi in apparato (la congettura non è più menzionata nelle edizioni successive dei frammenti di Aristotele di Rose). È opportuno notare che Bergk fondava la congettura ἰδρύσας sull'ipotesi che i versi fossero indirizzati a Eudemo di Cipro e che facessero parte del dialogo *Eudemo*.

Se non si resta convinti dell'esegesi di Gaiser—e per taluni aspetti, specialmente quelli legati alla cronologia di Eudemo di Cipro, essa desta sospetti—bisognerà trovare altre obiezioni oltre quelle di Theiler, che non si appoggino su ritocchi testuali troppo arditi.

VII

Eudemo di Rodi autore di un *Λινδιακὸς (λόγος)*? Un Eudemo autore di un *Λινδιακὸς (λόγος)* è citato quattro volte nella così detta *Anagraphe di Lindos* composta da due storici locali, Timachidas e Tharsagoras.⁷⁰ Si tratta di una lunga iscrizione trovata nelle vicinanze del Santuario di Atena a Lindos nell'isola di Rodi. La *Anagraphe*, preceduta da un decreto lindio che ne ordina la redazione, può essere datata al 99 a.C. Essa è divisa in due parti distinte: una raccolta di dediche e una raccolta di epifanie.⁷¹ L'identificazione dell'Eudemo citato nella *Anagraphe* è irresolubile a causa della mancanza di prove concrete.⁷² I frammenti conservati del peripatetico Eudemo di Rodi non recano tracce di un interesse specifico del nostro autore per argomenti storici, sia pure di storia locale. A favore della paternità del peripatetico può essere richiamato il fatto che l'autore del *Λινδιακὸς (λόγος)* era originario dell'isola di Rodi e vissuto prima del 99 a.C. Il contenuto della *Anagraphe* potrebbe inoltre essere riaccostato al fr. 150 che sembra provenire da una storia della teologia; ma anche l'attribuzione di quest'opera all'Eudemo di Rodi desta sospetti.

VIII

Ecco, in una breve sintesi, le conclusioni cui si può giungere a proposito della biografia di Eudemo di Rodi dall'analisi delle scarse testimonianze superstiti. Eudemo fu allievo di Aristotele durante il suo secondo soggiorno a Atene. Alla morte del Maestro, dopo che la scelta del successore era caduta su Teofrasto, Eudemo aveva abbandonato Atene e era rientrato a Rodi, dove aprì una propria scuola di filosofia.

⁷⁰ *FGrHist* 524 e 532 B 10, C 32, D 1 e 2. L'iscrizione fu pubblicata per la prima volta da Blinkenberg (1915) e riproposta in Id. (1941) no. 2, 148–99.

⁷¹ Da ultimo, Chaniotis (1988) 52–57 e Rossetti–Furiani (1993) 705–6.

⁷² L'identificazione risale a Wilamowitz (1913 col. 1372). L'accettano Blinkenberg (1915 e 1941); Rossetti–Furiani (1993) 670 n. 37. Dubitano Brink (1940) col. 930; Jacoby, *FGrHist* IIIb (Noten) 259 n. 3; Wehrli (1969) 77.

Aveva portato con sé copie di alcuni scritti aristotelici: probabilmente la *Fisica*, la *Metafisica* e alcuni libri dell'*Etica*. È altamente probabile che queste copie dei trattati di Aristotele conservate a Rodi fossero più tardi utilizzate per preparare una edizione delle opere dello Stagirita. Resta ancora incerta l'identificazione con Eudemo di Rodi del personaggio cui Aristotele aveva indirizzato i versi della sua "Elegia dell'altare" e soprattutto l'identità dell'Eudemo autore di una storia della città di Lindos.

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4

Eudemus' Work *On Expression*

William W. Fortenbaugh

Eudemus of Rhodes wrote a work entitled *On Expression*, Περὶ λέξεως. It was at least two books or rolls long and was the subject of a lost treatise by Galen.¹ Apparently the work was not only substantial but also full of interesting material. It is therefore regrettable that we have only a few fragments from which to judge the content of the work. Five fragments, nos. 25–9, are assigned to the work by Wehrli, but that may be too generous. In what follows, I intend first to consider Wehrli's five fragments and then to ask what we can conclude concerning the content of *On Expression*.

I

Fragment 25 comes from Alexander of Aphrodisias' *Commentary on Aristotle's Topics*. Alexander is discussing *Topics* 1.10 and in particular Aristotle's assertion that a dialectical premise (πρότασις διαλεκτική) is a question involving an opinion which is acceptable to

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¹ In *On His Own Books* 14, Galen lists *On Eudemus' On Expression*, three commentaries (p. 123.5–6 Mueller).

everyone, or to most people, or to the wise (104a8–10). Alexander first tells us that not every premise is a question, but the dialectical premise is; and that not every question is a dialectical premise, for there are several kinds of question (69.13–14 Wallies).² He then introduces a tripartite division of the question, citing Eudemus, who is said to have offered such a division in the books *On Expression* (69.15). The three kinds are as follows.

- 1) The question is about an attribute: *περὶ συμβεβηκότος*. It takes two forms: either one asks what attribute belongs to a given subject, or to what subject a given attribute belongs. Examples are: “What attribute belongs to Socrates?” and “Who is the sitting person?” (69.16–24)
- 2) The question is about essence: *περὶ οὐσίας*. The person who puts this kind of question wants to learn the essential nature of a given subject. It is illustrated by the example, “What is man?” (69.24–6)
- 3) The question is about a premise: *περὶ προτάσεως*. Here the questioner puts forward a proposition which may be either affirmed or denied. For example, “Is it the case that the cosmos is spherical?” (69.26–8)

Alexander tells us that the dialectical premise falls under the third kind of question, i.e., that which is *περὶ προτάσεως* (69.28–9). Alexander is certainly correct. The dialectical premise is part of an argument between two parties. One party puts a question like “Is it the case that the cosmos is spherical?” The question is introduced by ἄρά γε, “Is it the case that,” and the proposition which follows this formula becomes a premise in the argument, if it is accepted by the other party. That is not true of the first two kinds of question, i.e., those *περὶ συμβεβηκότος* and *περὶ οὐσίας*. In neither case does the question contain a proposition which can be simply affirmed or denied. Rather we have questions which are introduced by an interrogative pronoun, τί and τίνι, and which give rise to a proposition only when the respondent answers appropriately. For example, we get the proposition “Socrates is sitting,” when the question “What attribute belongs to Socrates?” is answered by “Sitting.” Similarly, the answer “Biped pedestrian animal” turns “What is man?” into “Man is a biped pedestrian animal.”

² Wallies’ text is found in *Commentaria in Aristotelem Graeca* vol. 2.2 (Berlin: Reimer 1891). References are to page and line number. A translation of Alexander’s commentary on *Topics* 1 is forthcoming in the Ancient Commentators Series, whose general editor is Richard Sorabji. I want to thank the translator, Jan van Ophuijsen, for sending me the most relevant portion of his translation.

The difference is clear, but it is not under discussion in *Topics* 1.10. There Aristotle distinguishes between questions which contain acceptable opinions and those which do not. The latter are said not to be dialectical premises, because no sensible person would put them forth; and if he did, no one would respond in the affirmative (104a5–8). Nevertheless, Alexander does nothing unexpected or irrelevant when he introduces Eudemus' tripartite division. I offer two considerations. First, in his immediately preceding comments, Alexander has focused on difference in form of expression (68.24, 69.6). In particular, he has called attention to the interrogative words ἄρα and πότερον, and stated that every premise becomes a problem when there is a change in the manner of verbal expression: ἀλλαγέντος τοῦ κατὰ τὴν ἐκφορὰν τρόπου κατὰ τὴν λέξιν (69.9–10).³ It is, therefore, not surprising that Alexander picks up on the word “question” (69.12 = *Topics* 104a8) and introduces a tripartite division of the question in which differences in expression are fundamental. Second, Eudemus' third kind of question, that which is περὶ προτάσεως, leads naturally enough to a distinction between demonstrative, dialectical and eristic premises, including the observation that neither the demonstrative nor the eristic premise becomes a dialectical premise when formulated as a question introduced by “Is it the case that.” To be a dialectical premise the question must contain a proposition which is reputable, ἔνδοχος (70.2–7), i.e., the sort of proposition which is not certain but nevertheless likely to be accepted by the respondent in the dialectical argument.

It should be pointed out that I have deliberately translated the phrase περὶ συμβεβηκότος with “about an attribute” and not with “about an accident.” The latter translation might suggest that questions περὶ συμβεβηκότος are restricted to accidental attributes, i.e., those attributes which can belong and not belong to a given subject.⁴ In fact, questions περὶ συμβεβηκότος are not so restricted;⁵ at least the examples occurring in Alexander's text suggest otherwise. Consider

³ On the dialectical problem, see Aristotle's *Topics* 1.10. An example of a problem is πότερον ὁ κόσμος αἰδίδιος ἢ οὐ; “Whether the cosmos is eternal, or not?” (104b9).

⁴ See, e.g., Aristotle, *Topics* 1.5 102b6–7.

⁵ Cf. Aristotle, *Metaphysics* Δ.30, where two senses of συμβεβηκός are recognized: first, what belongs to something neither necessarily nor for the most part (1025a14–15), and second, what belongs to each thing in virtue of itself, but is not in its essence, μὴ ἐν τῇ οὐσίᾳ ὄντα (1025a31–2). Questions περὶ συμβεβηκότος may cover attributes of both kinds.

“What is the natural motion of fire?” (69.18). The question concerns an attribute which is always present, not an accidental one which can be absent. To be sure, fire is on occasion prevented from rising, e.g., by a strong down-draft; but on such occasions fire does not lose its natural tendency to move upwards. Were it do so, what was fire would no longer be fire. The same holds for the question “Which of the goods is to be chosen for its own sake?” (69.21–2). If one answers “Virtue,” the attribute in question, that of being worthy of choice for its own sake, is not something which comes and goes; it is a permanent feature of virtue.

The distinction between accidental attributes and those which are necessary and always present is certainly of interest, as is the distinction between attribute and essence: τὸ συμβεβηκός and οὐσία. It would, however, be a mistake to think that all questions concerning an attribute belong to the first member of Eudemus’ tripartite division, i.e., to questions περὶ συμβεβηκότος, and that all questions concerning essence belong to the second member, i.e., to questions περὶ οὐσίας. On the contrary, questions concerning an attribute and questions concerning essence can also belong to the third member, i.e., to questions περὶ προτάσεως. For example, “Is it the case that man sits?” and “Is it the case that virtue is to be chosen for its own sake?” are questions which concern attributes, but they belong among questions περὶ προτάσεως. Similarly the question “Is it the case that man is (by definition, essentially) a biped terrestrial animal?”⁶ concerns essence, but it belongs among questions περὶ προτάσεως.

It would seem, then, that Eudemus’ division is primarily concerned with differences in form, as might be expected of a division set forth in a work entitled *On Expression*. Some questions take the form τί τούτῳ συμβεβήκεν; and τίνι τι συμβεβήκεν; They concern attributes, often accidental attributes, and for that reason they are called questions περὶ συμβεβηκότος. Other questions take the form τί ἐστὶ τούτο; Typically they concern essence and are labeled περὶ οὐσίαν. Still others begin with ἄρα γε followed by a proposition, and for that reason they are called questions περὶ προτάσεως. What puzzles me is whether this tripartite division is intended to cover questions of all kinds. In particular, what happens to the dialectical problem, the πρόβλημα, which is itself a question introduced by πότερον? If πρότασις in the phrase περὶ

⁶ Cf. Aristotle, *Topics* 1.4 101b31.

προτάσεως is a *terminus technicus* from the vocabulary of dialectic, then it contrasts with and excludes the πρόβλημα. But if πρότασις is used inclusively in the sense of “proposition,” then Eudemus’ third category might include the dialectical problem⁷ and other questions which involve a fully formed proposition. But there is no compelling reason to believe that Eudemus used πρότασις inclusively; and the idea that his tripartite framework covers all questions introduces new puzzles. For example, what should be done with questions requesting an explanation? Such a question might begin with διὰ τί followed by a proposition: e.g. διὰ τί ὁ κόσμος σφαιροειδής; “Why is the cosmos spherical?” or “Why is it that the cosmos is spherical?” The question could be assigned to the class περὶ προτάσεως; but unlike the dialectical premise, an adequate response must do more than merely affirm the proposition contained in the question. Indeed, an adequate response will often involve several new propositions which together explain the sphericity of the cosmos.

Immediately before citing Eudemus, Alexander refers to several kinds (more than one kind) of question, εἶδη πλείω τῆς ἐρωτήσεως (69.14). He goes on to list three kinds of questions—the second kind is introduced with ἄλλο and the third with τρίτον—but he does not say explicitly that Eudemus listed only three kinds. That suggests a new possibility: namely that Eudemus did not stop at three. But Alexander certainly gives the impression that Eudemus did stop at three, and I am prepared to believe that he did; for he was not, I think, interested in an exhaustive list. Rather he was interested in the form of the dialectical premise and content to mark it off from two other, more common forms of question. We may compare Aristotle’s *De interpretatione* 11, where the subject under discussion is what constitutes a single affirmation or single denial. Aristotle argues that affirming or denying one thing of many or many of one is not one affirmation or one denial (20b12–22). He makes the point with reference to the dialectical question (20b22–6),⁸ refers to the *Topics* (20b26) and adds parentheti-

⁷ Such an inclusive sense of πρότασις is recognized by Alexander, *Commentary on Aristotle’s Prior Analytics* 44.16–17. 23 Wallies (see n. 11).

⁸ At 11 20b22–3 the dialectical question is described as a request for a premise. In what follows, 20b23–4, 28–9, the premise is characterized as one side of a contradiction. That agrees with *Prior Analytics* 1.1 24a24–5, b1–2. When the dialectic premise is introduced by ἀπά γε, the second half of the contradiction is normally implicit (the

cally⁹ that the question τί ἐστὶ, “What is it?”, is not a dialectical question. For it to become such, the questioner must specify further whether man is this or not this (20b26–30). Here Aristotle’s point is simple: questions of the form “What is it?” are not dialectical questions for they do not present a premise which can be simply accepted or rejected. My suggestion is that Eudemus’ division is not very different: questions of two kinds, those about an attribute and those about essence, are marked off from questions about a premise. If that is so, we would like to know the context in which the Eudemian division occurred, but that is entirely lost. We can only observe that the Aristotelian parallel is in its context largely a footnote; Eudemus’ threefold division may have been the same.

Fragment 26 and Fragment 27 are best considered together. Fragment 26 is taken from Alexander’s *Commentary on Aristotle’s Prior Analytics*, and more precisely from the commentator’s discussion of Aristotle’s definition of ὅρος, “term,” at 1.1 24b16–18: ὅρον δὲ καλῶ εἰς ὃν διαλύεται ἡ πρότασις, οἷον τό τε κατηγορούμενον καὶ τὸ καθ’ οὗ κατηγορεῖται, ἢ προστιθεμένου ἢ διαιρουμένου τοῦ εἶναι ἢ μὴ εἶναι, “I (Aristotle) mean by ‘term’ that into which a premise resolves, i.e. the predicate and that of which it is predicated, with ‘to be’ or ‘not to be’ being either added or separated.”¹⁰ At the beginning of the comment, Alexander tells us that the terms in a simple premise are the noun and verb (14.27–8 Wallies),¹¹ that the parts of a premise are called “terms” (ὅροι) because a premise is determined (ὁρίζεσθαι) by them (14.29–30), and that every categorical or predicative premise is composed of a subject term and a predicate term (15.3–4). Alexander goes on to say that Aristotle did not want “to be” *qua* copula to be construed as a third term (15.4–14) and that “to be” in its existential use is equivalent to the copula plus “being” (15.14–22). There follows a two part

respondent can deny the proposition contained in the question); but it may be made explicit by adding ἢ οὐ. See Smith (1997) 59.

⁹ In his translation of the *De interpretatione*, Ackrill prints 11 20b26–30 in brackets.

¹⁰ The last clause is difficult, if not corrupt. Ross prints προστιθεμένου [ἢ διαιρουμένου] τοῦ εἶναι ἢ μὴ εἶναι.

¹¹ Wallies’ text is found in *Commentaria in Aristotelem Graeca* vol. 2.1 (Berlin: Reimer 1883). References are to page and line number. A translation by Jonathan Barnes, Susanne Bobzien, Kevin Flannery, S. J. and Katerina Ierodiakonou is available in the *Ancient Commentators Series*, general editor Richard Sorabji.

comment on awkwardness at the end of Aristotle's definition. The first part focuses on what it means "to remove 'to be'" (15.23–16.5); the second part deals with the status of "to be" and "not to be": they are said to be neither parts nor terms of the premise (16.5–14). Fragment 26 begins with the conclusion of the second part (i.e., at 16.12) and goes on to introduce an unexpected doubt. Alexander asks whether "it is absurd to say that 'is' in such premises is not predicated in any sense" (16.15–16), and adds that "Eudemus shows this at length in the first book of *On Expression*" (16.16–17). By "such premises," Alexander seems to be referring to premises like Σωκράτης λευκός ἐστι, "Socrates is white," for this premise is introduced as an example only three lines earlier (16.12 = line 1 of Wehrli's fragment).¹² If that is correct, and if the addition concerning Eudemus is a continuation of the same thought, then Alexander reports that Eudemus addressed the status of the copula and pointed out the absurdity in saying that it is not predicated in any sense.¹³

Fragment 27 is the last part of a scholion found in the margin of codex Parisinus 1917 f. 79 recto and verso. It faces Philoponus' *Commentary on Aristotle's Prior Analytics* 1.1 24b17. The opening and closing lines of the scholion were printed by Christian Brandis in his *Scholia in Aristotelem* 146a19–27. Here is the full text of the scholion.¹⁴

σύνηθές ἐστι τῷ Ἀριστοτέλει προσκατηγορούμενον λέγειν τὸ ἔστιν, οἷον ἄνθρωπος φιλοσοφῶν ἐστι· συγκατηγορεῖται γὰρ ἰδοῦ τὸ ἔστι κατὰ τοῦ ἀνθρώπου μετὰ τοῦ φιλοσοφῆν· ὅπερ δὴ ἐστὶν ὃ οὐ βούλονται οἱ περὶ Ἀλέξανδρον λέγειν ὅρον οὐδὲ μέρος προτάσεως, ἀλλὰ συνθέσεως ἢ διαιρέσεως μηνυτικὸν μόριον τῶν ἐν τῇ προτάσει ὄρων· καταφασκόμενον γὰρ τοῦτο συντίθησι τὸ ὑποκείμενον τῷ κατηγορουμένῳ ἀποφασκόμενον δὲ διαιρεῖ οἷον ὅτι τόδε ὑπάρχει τῷδε καὶ ὅτι τόδε οὐχ ὑπάρχει τῷδε· διὸ καὶ ὁ Ἀριστοτέλης "ὅρον δὲ καλῶ, φησὶν, εἰς ὃν διαλύεται ἡ πρότασις, προστιθεμένου ἢ διαιρουμένου τοῦ εἶναι ἢ μὴ εἶναι." τοῦ ἔστιν ἢ μὴ ἐστὶν δηλονότι. εἰ δὲ πολλάκις ὅρος δοκεῖ εἶναι τὸ ἔστιν ὡς ὅταν μόνον τεθῇ ἡγουν κατηγορηθῇ τοῦ ὑποκειμένου οἷον Σωκράτης ἐστὶν, ἀλλ' οὐδὲ τότε ὅρος ἐστὶ κυρίως, ἀλλὰ πάλιν προσκατηγορεῖται· ἴσον γὰρ ἐστὶ τὸ Σωκράτης ἐστὶ τῷ Σωκράτης ὃν ἐστὶ, καθὰ φησὶν ὁ Ἀλέξανδρος, οὐ λέγομεν δὲ οὕτως Σωκράτης ὃν ἐστὶν ἀλλὰ Σωκράτης ἐστὶ συντομίας χάριν καὶ τοῦ μὴ δοκεῖν

¹² It also occurs sixteen lines earlier at 15.33.

¹³ This is the view of Prantl 357–8, who warns against taking fragment 26 as identical with fragment 27.

¹⁴ I am grateful to Tiziano Dorandi for consulting the codex in Paris and to István Bodnár for providing me with a photocopy of the scholion.

ἀδολεσχεῖν· ἐγκεκλιμένον γάρ ἐστιν ἀπὸ τοῦ ὄν τὸ ἔστιν. Ἀριστοτέλης μὲν οὖν οὕτω φρονεῖ περὶ τοῦ ἔστι καὶ Ἀλέξανδρος. Εὐδημος δὲ ἐν τῷ πρώτῳ Περὶ λέξεως δείκνυσιν διὰ πλειόνων, ὅτι τὸ ἔστιν ἐν ταῖς ἀπλαῖς προτάσεσι κατηγορεῖται καὶ ὅρος ἐστίν, οἷον Σωκράτης ἐστί, Σωκράτης οὐκ ἔστι.

20

Aristotle is accustomed to say that “is” is an additional predicate, e.g. (in) “Man is pursuing wisdom.” For notice that (“is”) is predicated of “man” together with “to pursue wisdom.” It is this which those around Alexander do not want to call a term or a part of a premise, but rather a particle indicating the combination or separation of the terms in the premise. For this (particle), when affirmed, combines the subject with the predicate, and when negated, separates (them), e.g. (in saying) that this belongs to this, and that this does not belong to this. For this reason, Aristotle too says “I mean by ‘term’ that into which a premise resolves, with ‘to be’ or ‘not to be’ being either added or separated.” Clearly (by “‘to be’ or ‘not to be’” he means) “‘is’ or ‘is not’.” If “is” often seems to be a term, as when it alone is posited or predicated of the subject, e.g. (in) “Socrates is,” not even then is it a term in the strict sense. But again it is an additional predicate. For “Socrates is” is equivalent to “Socrates is a being,” as Alexander says, but we do not say in this way “Socrates is a being”; rather, (we say) “Socrates is” for the sake of brevity and not seeming to be garrulous. For “is” is an inflection of “being.” Aristotle therefore thinks this way about “is,” and (so does) Alexander. But Eudemus in the first (book of) *On Expression* shows at length that “is” in simple premises is predicated and is a term, e.g. (in premises like) “Socrates is,” “Socrates is not.”

On the whole, the scholion is clearly written and easily understood.¹⁵ In presenting the text, I have not hesitated to fill out abbreviations,¹⁶ to introduce new punctuation, to begin proper names with a capital,¹⁷ to add iota subscript and to correct accents. Of some interest is the form ἔστι(ν). The scholiast uses it seven times after the definite article: five times after τὸ, lines 1, 2, 10–11, 16, 18; and twice after τοῦ, lines 10,

¹⁵ There are only two places, in which it is not immediately clear what the scholiast wrote. One place is line 9, where the manuscript might be thought to exhibit twice a kappa together with a smooth breathing and a grave accent. However, comparison with other scholia (e.g., those on fol. 73^v and 78^v) makes clear that the kappa-like letter is in fact an eta, ἤ. That gives excellent sense (“or”) and receives support from the subsequent ἢ (the third occurring in line 10). The other place is line 17, where the manuscript has μὲ followed by two (?) letters which I do not recognize. I have printed μὲν. In a third place, line 6, the manuscript exhibits τὸν, which I have emended to read τὸ.

¹⁶ In lines 2 and 3, ἄνθρωπος is abbreviated in the manuscript. The same is true of Σωκράτης in line 19.

¹⁷ A special case is the title of Eudemus’ work *On Style*. The capital in Περὶ λέξεως is mine (line 18).

17.¹⁸ No semantic distinction is implied: i.e., the form ἔστιν is not being used to signify the existential “is” = “exists” as opposed to the copula. That is made clear by the first sentence of the scholion. There ἔστιν, i.e., τὸ ἔστιν, is followed by the example ἄνθρωπος φιλοσοφῶν ἐστί,¹⁹ in which ἐστί is the copula.²⁰ Rather, the scholiast is following a grammatical rule: namely Herodian’s injunction that ἔστί be used at the beginning of a phrase. The definite article functions as quotation marks, so that ἔστί is in the initial position.²¹ Similarly, the occurrence of ἔστί at the very end of the scholion conforms to the rules of Herodian: after οὐ the form ἔστί should be used.²²

Our special concern is the last sentence, in which Eudemus is named. He is said to have shown that in premises like “Socrates is” and “Socrates is not” the verb “is” is predicated and is a term. That suggests that Eudemus addressed the status of the existential “is,” and that Alexander’s report concerning Eudemus does not concern sentences like “Socrates is white” (16.12). Rather the report refers back to the discussion of “to be” in its existential use (15.14–22).²³ That may be correct, but it is doubtful that the scholion is independent of Alexander. The commentator is mentioned twice; and on the first occasion, the scholiast seems to borrow phrases from Alexander. The words ὅρον οὐδὲ μέρος προτάσεως in line 4 may be compared with Alexander 14.29–30, 16.7–8, and συνθέσεως ἢ διαιρέσεως μηνυτικὸν μόριον τῶν ἐν τῇ προτάσει ὄρων in lines 4–5 with 15.8–11. More striking is the sentence mentioning Eudemus. The words ἐν τῷ πρώτῳ Περὶ λέξεως δείκνυσι διὰ πλειόνων in lines 17–18 are identical to those found in

¹⁸ The same combinations are found in Philoponus: after τὸ 26.12, 15, 20 Wallies; and after τοῦ 26.35, 27.4. For ἔστί after the dative τῷ, see 27.10. References are to page and line number in CAG vol. 13.2.

¹⁹ In fact, the scholiast has written ἐστὶ and not ἐστί, but that does not affect the point I am making about the scholiast’s use of ἔστί.

²⁰ But if ἔστί(ν) following the definite article is not identical with the existential “is,” neither does it exclude the existential “is.” For in the last sentence of the scholion, τὸ ἔστιν is followed by the example, Σωκράτης ἐστί, Σωκράτης οὐκ ἔστί.

²¹ Herodian, *De enclisi*, in *Grammatici Graeci* vol. 3.1 p. 553.10 Lentz: τὸ ἔστιν ἡνίκα ἄρχεται λόγου. The fact that ἔστί is the only word to follow the definite article does not undo the fact that ἔστί is in the initial position. On ἔστί in this position, see Barrett (1964) 425–6. I am grateful to Herwig Görgemanns and Robert Todd for calling my attention to the comments of Barrett.

²² Herodian p. 553.10–11: τὸ ἔστιν . . . ὅτε ὑποτάσσεται τῇ οὐ ἀποφάσει.

²³ See Barnes et al. (1991) 62 n. 56 and 63 n. 61.

Alexander 16.16–17.²⁴ Even the word order is the same. Finally, the example Σωκράτης ἐστὶ in line 19 has a parallel at 15.15, 18, i.e., within Alexander’s discussion of “to be” in its existential use.

In view of these points of contact, it seems reasonable to say that the scholiast has drawn on Alexander. That need not mean that the scholion loses all value. On the contrary, the scholiast may have understood that on occasion Alexander concludes a comment with a short note or appendix whose context is not the immediately preceding lines.²⁵ And if he did understand that, he may have felt justified in connecting Alexander’s report concerning Eudemus with the earlier discussion of “to be” in its existential use. Assuming that is what happened, should we conclude that the scholiast is correct, and that when Alexander refers to “such premises” (16.15–16), he is referring back to his earlier discussion of “to be” in its existential use? Perhaps, but I hesitate to rule out a different, more inclusive possibility: namely that Eudemus discussed the copula as well as existential εἶναι; and that in both cases, he found it “absurd to say that ‘is’ is not predicated in any sense” (16.15–16).²⁶

Fragment 28 is from Alexander’s *Commentary on Aristotle’s Metaphysics*. The commentator is discussing Aristotle’s criticism of the Platonic forms and in particular Aristotle’s list of arguments which are introduced in favor of the forms, but which have negative consequences. The list includes arguments which are called “more exact”: some are said to produce forms of relations, and others to state the “third man” (990b15–17). Our concern is with Alexander’s comments on the latter: i.e., on arguments which “bring in” the third man (83.4, 85.8 Hayduck).²⁷ Alexander begins by setting out four versions of the argument. I give them in summary form.

²⁴ I ignore a simple variation in form: δείκνυσσι in the scholiast and δεικνύντος in Alexander.

²⁵ We shall see an example of such an appended remark in fragment 28.

²⁶ On this interpretation, the phrase “in such premises” (16.15–16) may be taken to cover the examples given throughout Alexander’s discussion of “term” (i.e., from 14.24 to 16.17); and these examples exhibit “to be” in both its copulative and its existential use.

²⁷ The text of Hayduck is found in *Commentaria in Aristotelem Graeca* vol. 1 (Berlin: Reimer 1891). References are to page and line in CAG vol. 1. A translation by William Dooley is available in the Ancient Commentators Series, general editor

1) The Platonists say that the things predicated in common of substances are in the proper sense such things, and they are forms. Furthermore, similar things are similar because they participate in the same thing, which is this thing in the proper sense; and this thing is the form. When these two principles are applied to particular men and to the form of man, it follows that there will be a third man apart both from the particulars and from the form, which itself is one in number. (83.34–84.7)

2) The sophists argue that if we say “Man walks,” we are not speaking about the form man, for forms are unmoved. Nor are we speaking about any particular man, for we do not know who this is. Therefore, there must be a third man of whom we predicate walking. (84.7–16)

3) Polyxenus the sophist argued that if man exists by sharing in the form of man, there must be some man who has his being by reference to the form. But that man is neither the form nor any individual man, so that there is some third man who has his being by reference to the form. (84.16–21)

4) If what is predicated of several things is something other than and separate from them, and if man is predicated both of particular men and of the form of man, there will be a third man distinct from particular men and the form, and then a fourth man and so on without end. (84.21–85.3)

After setting out the fourth argument, Alexander observes that this argument is the same as the first, for both involve the principle that similar things are similar by participation in some identical thing (85.3–5). He then says by way of conclusion that Aristotle exposed the arguments which appear to be “more exact” (85.5–9). Finally he appends a note concerning Eudemus and Aristotle. He tells us that the first interpretation of the argument was used by others and by Eudemus with clarity in *On Expression* (85.9–11) and that the last was used by Aristotle in the fourth book of *On Ideas* and later in the *Metaphysics* (85.11–12).²⁸

Alexander's note concerning Eudemus and Aristotle appears straightforward: Eudemus is associated with the first of the arguments set out above, and Aristotle with the fourth. That is the general scholarly opinion,²⁹ and it seems to be correct. Alexander has said only a few lines earlier that the first and the fourth arguments are the same (85.3–5); in a final note he tells us where they have been used. Nevertheless,

Richard Sorabji. A partial translation of the relevant passage (omitting arguments 2 and 3 below) is given by Gail Fine (1993) 18–19.

²⁸ The reference to a later passage in the *Metaphysics* is to A.9 991a2–3.

²⁹ E.g. Cherniss (1944) 233 and Fine (1993) 33, 255–6 n. 22.

Wehrli connects Eudemus with the second of the four arguments.³⁰ Perhaps the word ἐξήγησις, “interpretation” (85.10), tells him something, but he does not say so. My guess is that he is misled by Ross’ comment on *Metaphysics* 990b17. That comment begins with a brief characterization of the first argument, after which the other three are listed as one through three. It may be that Wehrli had this list in mind when he printed the second argument (= the first in Ross’ list) as that of Eudemus.³¹

Alexander names Eudemus’ work *On Expression* (85.11), but he is silent concerning why or in what particular context Eudemus introduced the first argument. Speculation here may be otiose; I limit myself to a single reflection. Alexander begins his account of the first argument by referring to substances (83.35), and these substances are undoubtedly primary substances: in particular, individual men like Socrates and Plato, who are named later (84.6–7).³² Along the way, Alexander says that what is predicated in common of certain things is something else apart from these things (84.3–4); and as a last word, he states that the form of man is one in number (84.7). At the end and throughout, the individuality of the form is given emphasis. That suggests to me a connection with Aristotle’s use of the third man argument in *Sophistical Refutations* 22. There the argument is introduced as an example of sophisms caused by form of expression: σχῆμα λέξεως.³³ The noun “man” is understood as referring to an individual, τόδε τι; but that is a mistake. It is a common term; and according to Aristotle, such terms signify a quality or a relation or a mode or something of that kind (178b36–9). Perhaps Eudemus made similar use of the third man argument in *On Expression*; but whether he did or not, he certainly was interested in mistakes attributable to expression. That will be clearer after we have discussed that last of Wehrli’s five fragments.

Fragment 29 is taken from Galen’s work *On Sophisms Caused by Expression*, Περὶ τῶν παρὰ τὴν λέξιν σοφισμάτων.³⁴ At the beginning

³⁰ Wehrli (1969) 86.

³¹ Wehrli (1969) 86 mentions Ross in the third line of his commentary on fragment 28.

³² Fine (1993) 221.

³³ For the Greek phrase, see *Sophistical Refutations* 4 165b27 and 166b10. For discussion of 22 178b36–179a10, see Cherniss (1944) 288–92 and Fine (1993) 219.

³⁴ I shall refer to Ebbesen’s edition (1981) in vol. 2. p. 1–26 of his three volume

of the work, Galen tells us that Aristotle, in the treatise *On Sophistical Refutations*, teaches six ways through which fallacies attributable to expression arise: namely, through 1) equivocation, 2) amphibology, 3) prosody, 4) composition, 5) division and 6) form of expression, (1 1.3–8 Ebbesen).³⁵ Galen goes on to elucidate the six ways (1 1.8–5.8) and to discuss at length whether Aristotle's list of six is exhaustive. The discussion proceeds through two stages. First, Galen argues that all fallacies attributable to expression are caused by duplicity, τὸ διττόν, or polysemy (2 7.7–12.6).³⁶ Second, he distinguishes between duplicity in a word and in a phrase or sentence (3 12.9–14.3), points out that words and phrases are duplicitous in three ways: in actuality, potentiality and appearance (3 14.3–6), and argues that the resulting six categories are covered by Aristotle's list. 1) Duplicity actually occurring in a word is said to result from equivocation, and 2) when it occurs in a phrase, to result from amphibology. 3) Duplicity potentially occurring in a word is attributed to prosody, and 4) when it occurs in a phrase, to composition and division. 5) & 6) Duplicity in appearance, which occurs both in words and in phrases, is referred to form of expression (3 14.6–18.10). That gives the following schema:³⁷

duplicity	:	in a word	:	in a phrase
in actuality	:	1) equivocation	:	2) amphibology
in potentiality	:	3) prosody	:	4) combination and division
in appearance	:	5) & 6) form of expression		

For examples of what has been said,³⁸ Galen refers to the works of Eudemus and others: τῶν προειρημένων τὰ παραδείγματα λάβοι τις ἂν ἕκ τε τῶν Εὐδήμου καὶ ἄλλων (3 18.10–11, keeping the reading of

work *Commentators and Commentaries*. References will be to the relevant chapter followed by page and line number.

³⁵ Galen 1 p. 1.6–8: παρ' ὁμωνυμίαν, ἀμφιβολίαν, προσωδίαν, σύνθεσιν, διαίρεσιν, σχῆμα λέξεως. Cf. Aristotle 4 165b26–7.

³⁶ Ebbesen (1981) translates τὸ διττόν with “duplicity” (vol.1 p. 14), and I follow him. In using “duplicity” I do not want to suggest a necessary tie to deceit, i.e., intentionally misleading someone; but in the context of a work on sophisms, a hint of deceit (or the possibility of deceitful use) seems appropriate.

³⁷ The schema is that of Ebbesen (1981, vol. 1 p. 14), who gives it in Greek.

³⁸ I.e., for examples of duplicity in each of the six categories.

the codex). That prompted Prantl to say that Eudemus was the first to recognize a tripartite division of polysemy into actual occurrences, potential and apparent.³⁹ Wehrli has followed Prantl and printed portions of Galen's text as a fragment of Eudemus' work *On Expression*.⁴⁰

Prantl and Wehrli may be correct. In *On His Own Books*, Galen lists a commentary on Eudemus' work *On Expression* (p. 123.3–4 Mueller). The commentary has been lost, but we can assume that Galen knew the Eudemian work well and could have drawn on it when writing *On Sophisms Caused by Expression*. Nevertheless, there are grounds for caution. Not only is Eudemus' work *On Expression* not cited by Galen in the relevant portion of *On Sophisms*, but also the occurrence of the name "Eudemus" is problematic. Ebbesen reports the reading of the sole manuscript as εὐδύμου or εὐδήμου, and he prints Εὐθυδήμου, changing the preceding definite article from τῶν to τοῦ. That gives the following text: τῶν προειρημένων τὰ παραδείγματα λάβοι τις ἂν ἔκ τε τοῦ Εὐθυδήμου καὶ ἄλλων. On this reading, Galen is referring for examples not to Eudemus but to Plato's *Euthydemus* and to other dialogues like the *Protagoras* and *Gorgias*.⁴¹ That is certainly possible, especially as several of the examples given by Aristotle in the *Sophistical Refutations* have parallels in the *Euthydemus*.⁴² That will not have escaped the notice of Galen, who might well refer to the *Euthydemus* and other Platonic dialogues for examples of duplicity.

Further support for Ebbesen's emendation comes from Alcinous, who was probably an older contemporary of Galen. In his *Didascalicus*,⁴³ he cites the *Euthydemus* for ways to deal with sophisms and draws a distinction between those which are παρὰ τὴν φωνήν and those which are παρὰ τὰ πράγματα (6.9 p. 14.6–7 Whittaker). The distinction apparently coincides with that drawn by Aristotle in *On*

³⁹ Prantl (1855) vol. 1 p. 398–9.

⁴⁰ Wehrli (1969) 86–7.

⁴¹ Ebbesen (1981) vol. 1 p. 15–16.

⁴² E.g., for Aristotle's first example of equivocation at *Sophistical Refutations* 4 165b31–4, see *Euthydemus* 276A1–C7; and for the fifth example of amphibology at 4 166a12–14, see *Euthydemus* 300A7–D5. For fuller discussion of the parallels, see Dorion (1995) 91–104, who points out that Aristotle may not be drawing on the Platonic dialogue, but on a collection of fallacies put together by Euthydemus. I return to the idea after a brief remark concerning Alcinous.

⁴³ The *Didascalicus* has in the past been attributed to Albinus, but scholars today generally accept attribution to Alcinous. See, e.g., the introduction of John Dillon to his translation of the work, p. ix–xiii.

Sophistical Refutations, i.e., the distinction between fallacies *παρὰ τὴν λέξιν* and those *ἔξω τῆς λέξεως* (4 165b24),⁴⁴ of which the former is under discussion in Galen's work *On Sophisms*. If that is so, Galen may be doing what Alcinous does: citing Plato's *Euthydemus* and not Aristotle's pupil Eudemos.⁴⁵

One concern should be mentioned. Ebbesen has emended not only the proper name found in the manuscript but also the preceding definite article. That is necessary if we are going to read "Euthydemus" and to construe the name as a title. But it is not, I think, impossible that Galen cited Euthydemus himself, in which case the definite article can be left in the plural: "from the (writings, or sophisms) of Euthydemus." We may compare Aristotle, *Sophistical Refutations* 20. There in a discussion of sophisms caused by combination and division, Aristotle cites Euthydemus for an example involving the location of the Athenian fleet (177b12–13). The example is also found in *Rhetoric* 2.24, where again it is attributed to Euthydemus (1401a26–8). The example is not found in Plato's *Euthydemus*.⁴⁶ It may have been passed on orally, but equally the sophisms of Euthydemus may have been collected, perhaps by the sophist himself, and been in circulation not only in the time of Aristotle but also in the time of Galen, 2nd c. A.D.

There are other reasons for treating Galen's text with caution. I mention three. First, Wehrli is wrong to suggest that the third member of Galen's tripartite division, i.e., duplicity in appearance, originates with Eudemos, who took it over from *Sophistical Refutations* 4 165b24–5: *ἔστι δὲ τὰ μὲν παρὰ τὴν λέξιν ἐμποιοῦντα τὴν φαντασίαν ἔξ τὸν ἀριθμόν*, "The methods of producing a false appearance through ex-

⁴⁴ Ebbesen (1981) vol. 1, p. 15, 33; Dillon (1993) 84.

⁴⁵ Hans Gottschalk, n. 10 of his article in this volume, finds further confirmation of Ebbesen's emendation in Simplicius, *On Aristotle's Categories* 1a1. There the commentator considers why Aristotle begins his work with remarks concerning homonymy, synonymy and paronymy. He cites Porphyrius (21.4–21 Kalbfleisch), Andronicus (21.21–22.1) and Iamblicus (22.1–9), after which he notes the importance of defining words and makes special mention of Plato, who in the *Euthydemus* says that verbal duplicity gives great impetus to dialectic. Everyone else is said to agree (22.9–13). Ph. Hoffmann's French translation of Simplicius' commentary on the *Categories* may be found in Hadot (1990, fasc. 3 p. 5–6). An English translation is forthcoming in the Ancient Commentators Series, whose general editor is Richard Sorabji. I want to thank the translator, Michael Chase, for sending me the relevant portion of his translation.

⁴⁶ Poste (1866) 151, Cope (1877) vol. 2 p. 307–9, and Dorion (1995) 100–1.

pression are six in number.”⁴⁷ Here φαντασία refers generally to false impressions arising in all six ways listed by Aristotle. In contrast, Galen picks out duplicity in appearance as one of three major kinds (3 14.3–5, 18.6–8). Of course, Eudemus could have anticipated Galen and introduced his threefold division—the first two categories, in actuality and in potentiality, have good Peripatetic roots—but if he did he was not simply picking up and expanding a line in the *Sophistical Refutations*.

Second, Galen’s division of fallacies is not a simple systematization of what Aristotle sets forth. Aristotle’s fourth and fifth causes of fallacy are treated together in Galen as potential duplicity in phrases. Aristotle’s sixth cause, figure of expression, becomes in Galen the fifth and sixth kind of duplicity, i.e., duplicity in appearance both in word and in phrase. Here, too, Eudemus could have anticipated Galen; but it becomes unlikely when we consider the third ground for caution: namely that Galen refers to a work of his own for the distinction between the actual, potential and apparent (3 14.5).⁴⁸ Had Eudemus already developed the distinction in question, we might expect Galen to refer to him, especially if Galen was prepared to refer to Eudemus for examples of duplicity in actuality, potentiality and appearance. But if Eudemus is not Galen’s source either for the threefold division or for examples of duplicity, then we need not wonder at Galen citing a work of his own.

Even if we lose Fr. 29, we need not conclude that Eudemus was disinterested in mistakes attributable to expression. In regard to fragment 28, I have already suggested that Eudemus may have introduced the third man argument in order to illustrate sophisms caused by form of expression, σχῆμα λέξεως, which is Aristotle’s sixth category. A different example is suggested by Wehrli’s fragment 61, a passage taken from Simplicius’ *Commentary on Aristotle’s Physics*.⁴⁹ Eudemus is reported to have dealt with an objection to locating movement in that which is affected and moved. The objection turns on verbs of sensing, e.g., ὁρᾶν “to see” and ἀκούειν “to hear,” which are active in form. Eudemus pointed out that in such cases we are deceived because we attend to the

⁴⁷ Wehrli (1969) 86: “φαντασία ist sogar aus dem oben ausgeschriebenen Text (i.e., 165b24–5) übernommen.”

⁴⁸ Galen does not identify the work by title; see Ebbesen (1981) vol. 1 p. 15, 78–9.

⁴⁹ The passage is discussed by Bob Sharples in his article (this volume).

verbal expression, ἀπατώμεθα . . . τῇ λέξει, and fail to consider that what perceives is affected (439.17–23 Diels). Here we have Eudemus recognizing in a physical context Aristotle's sixth kind of sophism: namely that caused by form of expression. Did he do the same in *On Expression*? No text tells us that he did, but we should, at least, take note of two passages in Aristotle's *Sophistical Refutations*. In the first, Aristotle observes that we can use an active verbal form to refer to something which is not of the nature of an action (4 166b15–16); and in the second, he applies the observation to the verb ὁρᾶν (22 178a11–16).⁵⁰ Eudemus will have known these passages well; and in discussing expression, it is, I think, unlikely that he ignored Aristotle's treatment of fallacies attributable to form of expression.⁵¹ That makes me hesitate before rejecting fragment 29; nevertheless, the reasons for doing so are strong.

II

The preceding survey of Wehrli's five fragments has left us with three independent fragments: 25, 26 and 28. Fragment 27 seems to be dependent on fragment 26, and fragment 29 is most likely not a fragment at all. That is discouraging. Our sources are too few to develop a satisfactory picture of the work *On Expression*. Nevertheless, what we do have suggests that Eudemus observed the importance of expression in argumentation. Fragment 25 comes from Alexander's commentary on the *Topics*. We learn that Eudemus marked off two common forms of question from the dialectical question, which puts forward a premise for acceptance or rejection. Fragment 26 is from Alexander's commentary on the *Prior Analytics*. It tells us that Eudemus discussed the status of the verb εἶναι in a premise of two terms. If fragment 27 interprets Alexander correctly, εἶναι in its existential use will have been discussed and possibly analyzed into the copula plus participle. Fragment 28 reports that Eudemus used the third man argument. We are not told how or why, but we can imagine a discussion of sophisms attributable to expression. Finally fragment 29, probably spurious, has led us to other texts which reinforce the idea that Eudemus concerned himself with fallacies which turn on expression.

⁵⁰ Cf. Galen, *On Sophisms* 1 5.2–8 and Ebbesen (1981) vol. 1 p. 82.

⁵¹ I would say the same in regard to the other five kinds discussed by Aristotle in the *Sophistical Refutations*.

This concern with expression in argumentation may have manifested itself in other ways. I mention a single possibility which is suggested by remarks of Galen in his *Introduction to Logic* 3.3–5.⁵² Here we are told that the older philosophers, i.e., Peripatetics like Eudemus and Theophrastus, called a premise “hypothetical by connection,” when it is believed that something is the case, because something else is the case; and that they spoke of “hypothetical by separation,” when it is believed that because something is not the case, something else is. Galen notes that the more appropriate form of expression, οἰκειότερα λέξις, for a separative premise is by means of the conjunction “or”; and in the case of a hypothetical by connection, it is by means of “if.” We are told that these one syllable words may be expressed in two syllables: ἢ or ἥτοι, εἰ or εἴπερ;⁵³ and we are given an example of each kind of premise: “If it is day, the sun is above the earth” is hypothetical by connection and “Either it is day, or it is night” is hypothetical by separation. Galen goes on to point out that the separative premise “Either it is day, or it is night” is logically equivalent to “If it is not day, it is night,” which in form of expression, ἐν σχήματι λέξεως, is conditional; but when one considers the nature of the facts, it is called disjunctive.⁵⁴ Similarly, a form of expression, εἶδος τῆς λέξεως, like “If it is not night, it is day” is conditional; but by the nature of the facts, it is disjunctive. Here Galen distinguishes between differences in expression on the one hand and separation in nature and causal connection on the other.⁵⁵ How much of this Eudemus spelled out is, of course, prob-

⁵² The text is printed with translation in *Theophrastus of Eresus: Sources*, 111D FHS&G.

⁵³ In many contexts, εἴπερ is simply a strengthened form of εἰ; but in others, εἴπερ implies that the antecedent is a fact, as against a possibility. In oratory, that is of some importance: the antecedent needs no supporting argument; when εἴπερ replaces εἰ, “since” replaces “if,” the conditional becomes an argument with one premise. Early Peripatetics like Eudemus and Theophrastus are likely to have discussed the matter, perhaps as part of a larger study of appropriate expression in argumentation. See Fortenbaugh (1998a) 42–3, with note 48.

⁵⁴ Here (3.5) Galen uses the Stoic terms συνημμένον, “conditional,” and διεξυγμένον, “disjunctive.” In the preceding section, (3.4) he has explained that what the Stoics call a συνημμένον ἄξιωμα, “conditional proposition,” and a διεξυγμένον ἄξιωμα, “disjunctive proposition,” the Peripatetics refer to as a πρότασις ὑποθετική κατὰ συνέχειαν, “hypothetical premise by connection,” and a πρότασις ὑποθετική κατὰ διαίρεσιν, “hypothetical premise by separation.”

⁵⁵ The hypothetical by connection is the appropriate form for expressing causal connection (δὴ ἕτερον 3.3). E.g., “If it is day, the sun is above the earth” (3.4) is a

lematic.⁵⁶ Even more so is the idea that Eudemus addressed the matter in *On Expression*. I suggest only that he may have done so.

Having emphasized expression in relation to argument, I now want to introduce a caveat. We cannot conclude on the basis of three to five texts that Eudemus' *On Expression* was narrowly focused on argument and therefore very different from the like named works of Aristotle and Theophrastus. The Aristotelian work is listed by Diogenes Laertius in his catalogue of Aristotle's writings (5.25). It contained two books or rolls, which are often identified with the two parts of Aristotle's *Rhetoric* 3. One book will have concerned itself with rhetorical style, which is the topic of *Rhetoric* 3.1–12, and the other with the arrangement of an oration, which is the topic of 3.13–19.⁵⁷ If that is correct, there may well be a significant difference between the Eudemian and Aristotelian works; and the same may be true in regard to the Theophrastean work. In Diogenes' catalogue it is assigned one book (5.47), and the surviving fragments suggest a rhetorical work in which topics like beautiful words, balanced structure and similarity in sound were discussed.⁵⁸ Here we need to remember that the Eudemian work contained more than one book. Fragments 26 and 27 refer to the first book, ἐν τῷ πρώτῳ, of *On Expression*, and fragments 25 and 28 refer to the books, ἐν τοῖς, (plural). That tells us that the Eudemian work was at least two books long, and it may have been longer.⁵⁹ In that case, there was room to discuss not only expression in regard to argument but also expression in elevated literature, poetry as well as oratory.

We should also remember that the identity of Aristotle's work *On Expression* with Book 3 of the *Rhetoric* is a guess, which has found favor for two reasons. First, Diogenes' catalogue lists a *Rhetoric* in two books (5.24). It is assumed, not unreasonably, that those two books correspond to the first two books of our *Rhetoric* in three books. To find

hypothetical by connection, in which the antecedent is affirmative and the cause is stated in the consequent.

⁵⁶ In this passage, *Introduction to Logic* 3.3–5, Galen mentions the Stoics alongside the Peripatetics; and in the last section, 3.5, Stoic terminology is dominant. In the first sentence, διαίρητική is Peripatetic, but the other *termini technici*, συνημμένον (three times) and διεξευγμένον (twice), are Stoic. See above, note 54.

⁵⁷ Moraux (1951) 103–4.

⁵⁸ For beautiful words, see 688 FHS&G, and for balanced structure and similarity in sound, see 692 FHS&G. For the view that the Eudemian and Theophrastean works were fundamentally different, see Schenkeveld (1998) 79–80.

⁵⁹ Martini (1909) col. 901.

the missing third book, one is tempted to look to *On Expression* and to say that its two books are identical with *Rhetoric* 3.1–12 and 3.13–19. Second, this identity is supported by a widely held belief concerning Andronicus of Rhodes: namely that he edited Aristotle's writings and in doing so combined closely related texts. He will have inspected the work *On Expression*, determined that it belonged to rhetoric and made it Book 3 of the *Rhetoric* we know today. That is possible, but the editorial work of Andronicus is not well documented and may be more the creation of modern scholars than serious historical fact.⁶⁰ Furthermore, *Rhetoric* 3.1–12 and 3.13–19 are not a well-matched pair. Indeed, 3.13–19 appears to have been an independent handbook which was awkwardly added to the *Rhetoric* in order to supply some discussion of arrangement. I am, therefore, hesitant to accept the identity of *On Expression* and *Rhetoric* 3. Rather I am inclined to believe that Aristotle's work *On Expression* was a rather full treatment of the topic announced in the title,⁶¹ and that this treatment became the basis of subsequent discussions. Eudemus' *On Expression* is likely to have added some new material, e.g., a discussion of appropriate expression in hypothetical premises, but it will also have been largely Aristotelian. And both works may have been two books long.⁶²

Discussion of Eudemus' work in relation to that of Aristotle is complicated by a passage in Simplicius' commentary *On Aristotle's Categories* 41b25–42a10 (65.2–10 Kalbfleisch).⁶³ There Aristotle is said to have discussed negative expressions and inflections with reference to the categories, and he is said to have done so in the *Methodics*, *Divisions* and *Matters concerning Expression*, Τὰ περὶ τὴν λέξιν.⁶⁴ Accord-

⁶⁰ See Barnes (1997) 1–69.

⁶¹ It is possible that the title refers only to the first portion of the work—occasionally a title refers only to the chapters with which a work begins (Morau [1951] 103)—but it is simpler and less speculative to understand the title as an indication of what the work as a whole contained.

⁶² Galen's work *On Eudemus' On Expression* is listed as "three commentaries" (Galen, *On His Own Works* 14 p. 123.5–6 Mueller). That does not mean that the Eudemian work was three books or rolls long: one book being the subject of each commentary. We may compare Galen's work *On (Aristotle's) De interpretatione*; it is listed as "three commentaries" (14 p. 122.20). Here a single book is the subject of three commentaries.

⁶³ I am grateful to Rainer Thiel for calling the passage to my attention. It was printed with some variations in text by V. Rose, *Aristotelis qui ferebantur librorum fragmenta* (Leipzig: Teubner 1886) fr. 118 p. 107.20–108.6.

⁶⁴ In one manuscript of Simplicius' commentary (K, 14th c.), the last of the three

ing to Simplicius, the last named work was deemed spurious by some persons, but in any case it was a work of Peripatetic authorship. I offer two comments. First, it is not certain that *Matters concerning Expression* is to be identified with the work *On Expression* listed in Diogenes' catalogue of Aristotelian writings (5.25). The former may have been a preliminary study or collection of material used in the latter; or the former may have been spurious and the latter genuine. But if the work cited by Simplicius is the work listed in Diogenes' catalogue, then it is not to be identified with *Rhetoric* 3. For the third book contains no discussion of negative expressions and inflections with reference to the categories. Second, whoever the author may have been, *Matters concerning Expression* apparently contained discussion of the relationship between (kinds of) expression and the categories. That helps us understand the Anonymous Coislinianus, who remarks that a work *On Expression* could be regarded as a substitute for works entitled *Categories* (xxiii.34–6 Busse).⁶⁵ That Eudemus' work could be so regarded is in my judgment unlikely, but both it and the like named work of Aristotle may have devoted space to questions concerning categories.

The case for distinguishing sharply between the works of Eudemus and Theophrastus appears stronger. The Theophrastean fragments are rhetorical and the work was only one book in length. Of course, Usener wanted to make the work four books long, but today no one accepts his view.⁶⁶ Nevertheless, there is reason for caution. Apart from being listed in Diogenes' catalogue, Theophrastus' work *On Expression* is cited by title only twice (nos. 688 and 692 FHS&G). There is, of course, a bundle of texts which are properly brought under the rubric style or expression,⁶⁷ but it does not follow that they all come from the work *On*

Aristotelian titles occurs as τὰ παρὰ τὴν λέξιν. That suggests a work concerned with sophisms caused by expression (cf. the work of Galen entitled Περὶ τῶν παρὰ τὴν λέξιν σοφισμάτων); but the manuscript is comparatively late (J which has περὶ is 11th c.) and is likely to involve an unnecessary emendation. The preposition περὶ was changed to παρὰ by a scribe or someone else who knew that περὶ plus genitive is more common in titles, and perhaps recalled Aristotle's use of the phrase παρὰ τὴν λέξιν in the *Sophistical Refutations* 4 164b24. For some remarks on περὶ plus the accusative in titles, see Fortenbaugh (1988b) 190–1 with note 35.

⁶⁵ Busse's text is found in *Commentaria in Aristotelem Graeca* vol. 4.5 (Berlin: Reimer 1897) xxiii.34–6. The text with translation also appears as Theophrastus 71G FHS&G.

⁶⁶ Usener (1858) 9. 20; repr. p. 57. 66–7. The last person to endorse Usener's view was Wehrli (1983) 513. See Fortenbaugh (1998b) 186–7, 194 with note 50.

⁶⁷ In FHS&G, nos. 681–704 are collected under the rubric *Elocutio*.

Expression. And even if they do, there is no compelling reason to think that they exhaust the topics discussed by Theophrastus in *On Expression*. A work in one book has room for a wide variety of topics; and Theophrastus may have chosen to express himself succinctly, when discussing topics adequately dealt with by Aristotle.⁶⁸ Perhaps, then, Wehrli is correct, when he explains the difference between the fragments of the Eudemian and Theophrastean works as an accident of transmission.⁶⁹

Whatever the truth concerning the work of Aristotle and Theophrastus, we should take seriously the possibility that Eudemus' work included discussion of oratorical and poetic style. Among the sayings of Eudemus preserved in Arabic sources, we find the following: "He (Eudemus) said, 'The word is matter, the meaning form; speech is its perceptible aspect, and style the beauty of the perceptible aspect.'"⁷⁰ The Arabic word translated by "style" implies eloquent style; it is immediately explained as beauty of the perceptible aspect. "Perceptible" occurs twice and translates an Arabic word whose primary meaning is "visible." Out of context the second occurrence could be understood in this primary sense (metaphor may be used to evoke beautiful images); but when the two occurrences are taken together and in their context, a more inclusive sense, i.e., translating "perceptible," is almost certainly correct. "Word" at the beginning of the saying means spoken word or voice, φωνή, and speech as "its perceptible aspect" refers to audible statements and the like. Hence, the subsequent reference to the "beauty of the perceptible aspect" ought to include *inter alia* the avoidance of hiatus, balanced clauses and prose rhythm.

I do not want to lay great weight on a single saying transmitted to us by Arabic sources,⁷¹ but I do want to underline that a full treatment of

⁶⁸ Cf. Boethius, *On Aristotle's De interpretatione*, 2nd ed., 1 introduction = 72A FHS&G: "On all matters about which he argues after his master, he touches lightly on those which he knows have been said by Aristotle earlier, but follows up more diligently other things not dealt with by Aristotle."

⁶⁹ Wehrli (1983) 531. I record Wehrli's statement as a serious possibility and not because I accept it without qualification. Certainty is, I fear, unobtainable.

⁷⁰ The saying is no. 6 in the list compiled by Dimitri Gutas elsewhere in this volume. My few remarks on the meaning of the Arabic words are entirely dependent on Gutas.

⁷¹ The saying is referred only to Eudemus; no work is mentioned. Failure to refer to a work is not in itself grounds for questioning the authenticity of the saying. None of the sayings attributed to Eudemus mentions a work; such silence is typical of the genre.

expression will not omit discussion of voice. In this regard, it may be instructive to consider Aristotle's *Poetics*, for there Aristotle begins a discussion of expression by taking note of various forms of expression, σχήματα λέξεως. He means different speech acts—the command, prayer, statement, threat, question and answer—which differ in intonation and are best understood by the person who has mastered delivery (19 1456b8–13). Aristotle goes on to discuss the parts of expression, μέρη τῆς λέξεως, beginning with the element, i.e., the letter, and the syllable. For detailed investigation, we are referred to works on metrics (20 1456b20–38). In referring speech acts to delivery and letters and syllables to metrics, Aristotle is not saying that these topics have no place in an inclusive study of expression; rather he is taking note of the fact that these topics have been studied by specialists and that they are not fundamental to poetics. They are in fact more basic, being essential to clear communication. The verb ἐβάδισεν is called by Aristotle an inflection according to the delivery. It may express a fact: “He walked”; but given the right intonation, it is a question” “Did he walk?” (20 1457a21–3). And the letters ου convey different meanings depending on aspiration and pitch accent: οὐ̇ and οὐ̈. Wrongly expressed they render a sentence unintelligible or give rise to what Aristotle calls a sophism through prosody (20 1456b31–3, *Sophistical Refutations* 4 166b1–6, 21 177b35–178a2).

My conclusion should be apparent. Given that Eudemus' work *On Expression* was two or more books in length and given that we possess very few fragments of the work, we should not assume that the work was narrowly focused on expression in argumentation. It may have included much more, e.g., the elements of spoken communication, diction and composition, and the virtues of style both in regard to prose and poetry. Equally, we should not assume that Eudemus addressed all these topics. For aside from a single saying attributed to Eudemus in Arabic sources, there is no surviving fragment which exhibits an interest in elevated prose and poetry. Eudemus may have been a logician, mathematician and scientist whose primary concern with expression was of a logical nature.

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5

Did Aristotle Reply to Eudemus and Theophrastus on Some Logical Issues?

Pamela M. Huby

Although this paper is on Eudemus' logic, this was a general conference on Eudemus and not one on logic. This paper therefore concentrates on the nontechnical aspects of the situation. It has turned out to be impossible to avoid all technicalities, but I hope not to dwell on them over much.¹

Eudemus has suffered historically from the fact that in his most important work, that on modal logic, his name is linked so closely with that of Theophrastus that we cannot distinguish his separate contribution. He is mentioned by name by ibn-Butlan = 87F FHS&G, Alexander 10aW = 90A FHS&G, 16W = 102A FHS&G, 11abW = 106AC FHS&G, 19W = 107A FHS&G, Philoponus 10bW = 90B FHS&G, 11deW = 106DG FHS&G, Boethius 17abcW = 91D FHS&G, Aratus 18W = 93 FHS&G, Themistius = 94 FHS&G, Averroes = 98BD, 105, 106H–I FHS&G, Anon. (Menas) 15W = 102C FHS&G, Pseudo-

¹ I have used traditional names and symbolism where necessary, e.g. AaB for 'A belongs to all B' etc. For modal propositions I use **N** for necessary, **M** for possible, and **X** for assertoric. I have given references to Wehrli's collection of fragments by means of the appropriate numbers followed by W, and to the recent and more extensive collection of Theophrastean sources by using FHS&G.

Ammonius 13, 14W = 103CD FHS&G, 11cW = 106E FHS&G. He is also almost certainly one of the colleagues or associates of Aristotle mentioned by Alexander at 102B FHS&G, 108A FHS&G, and in other expressions elsewhere. In the context of logic it seems to me certain that these were Theophrastus and Eudemus. Mignucci² has argued against this: he says that Alexander was so meticulous that he would have identified the people described as colleagues if they had been known to be Theophrastus and Eudemus. But in fact Alexander is not always precise in his references. Thus at *On Aristotle's Prior Analytics* 140.32–141.3 (100D FHS&G) he refers only to “his colleagues” on a point which at 36.25–32 (100A FHS&G) he attributes to Theophrastus, and at 156.29–157.2 (100B FHS&G) even more specifically to “Theophrastus in the first book of his *Prior Analytics*”; again at 220.9 (16W = 102A FHS&G) he refers to Theophrastus and Eudemus, but on the same point has only “his colleagues” at 223.4–5 (102B FHS&G); further, this very reference at 220.9 with the names of both Theophrastus and Eudemus, refers back to 41.27 where only Theophrastus is mentioned.

Another problem is the meaning of *hoi peri X*—“those around X.” It has been argued that this is always equivalent to X, but that does not seem always to be true, and in certain cases it cannot be true. So “those around Theophrastus” need not mean just Theophrastus himself.³ In particular it is clear that on occasion only Theophrastus is mentioned when it is reasonable to suppose that Eudemus was involved too.

It is only on logic that we have this mass of evidence that Theophrastus and Eudemus worked together in opposition to Aristotle. And for Eudemus there are only two pieces of evidence that relate to something in logic unconnected with Theophrastus, a passage on questions, given by Alexander of Aphrodisias, *On Aristotle's Topics* 69.15–28 (25W), for which see Fortenbaugh, who raises doubts about the

² Mignucci (1965) 227–77.

³ I thank Bob Sharpley for pointing out that Simplicius *On Aristotle's Physics* 788.344ff. on Time (91W = 151B FHS&G) refers to Theophrastus and Eudemus as the colleagues of Aristotle, and that Galen in *On the Method of Treatment* 2.6 (337 FHS&G) and *On the Composition and Powers of Simple Drugs* 1.39 (420 FHS&G) to “those around Theophrastus.” He even has “those around Theophrastus and Aristotle and Mnesitheus” at *On the Composition and Powers of Simple Drugs* 1.28 (419 FHS&G). See Dubuisson (1977) 265–66.

logical nature of this passage,⁴ and one which appears to be from the first book of Eudemus' own *Analytics* about the place of destructive as opposed to constructive argument in dialectic.⁵ On the other hand the two are reported as having been in agreement on many aspects of syllogistic argument. Against this it is Theophrastus alone who is named in accounts of the statement, with the exception of Ibn-Butlan in Ibn-Abi-Usaibi'a,⁶ a speculative tale which we can ignore. They are also mentioned together on hypothetical syllogisms by Boethius, Philoponus, Farabi, and Alexander,⁷ but here their separate work is distinguished as it is not with modal logic, and Boethius quotes Eudemus alone on hypotheses.⁸

They are also both said to have written *Categories* in imitation of, or in rivalry with, Aristotle but the value of these late works is small.⁹ It may be significant that Philoponus (7W = 71E FHS&G) and a late scholiast¹⁰ added also the name of Phantias, a fellow student of Aristotle, apparently using a different source. It is unfortunate that Diogenes Laertius did not devote a section to Eudemus, so that we have no list of his works of the kind that we have for Aristotle and Theophrastus. It is plausible to suppose that the two men did their work at least on modal logic in Athens before Aristotle's death, for after it Eudemus went off to Rhodes, and, while they corresponded, they are unlikely to have had close contact, though the Greeks were great seafarers, and connections between Rhodes and Athens must have been frequent, and they may have met at intervals.

I suggest, then, that Theophrastus and Eudemus knew Aristotle's teachings on logic more or less as we have them in the *Prior Analytics*,

⁴ In this volume, Chapter 4, Section I.

⁵ Also from Alexander's *On Aristotle's Topics* 131.11–17 (9W).

⁶ *Essential Information on the Generations of Physicians* 14, 2:102.18–20 Mueller (87F FHS&G).

⁷ Boethius, *On the Hypothetical Syllogism* 1.1.27–30 Obertello; Philoponus, *On Aristotle's Prior Analytics* p. 242.18–21; Farabi, *On Aristotle's De Interpretation* p. 53.6–12 Kutsch and Marrow; Alexander, *On Aristotle's Prior Analytics* p. 390.2–3 (21, 22, 20 W = 111ABCE FHS&G).

⁸ Boethius, *On the Hypothetical Syllogism* 1.2.48–56 Obertello (23W).

⁹ By David, *On Porphyry's Isagoge* p. 102.5–6 Busse (8W); Ps.-Elias, *On Porphyry's Isagoge* p. 63.22–23; Philoponus, *On Aristotle's Categories* 7.19–22.

¹⁰ Cod. Laur. 85.1 f. 27, in Rose (1893, 129.20–21) (app. 71C FHS&G), where however we read Cleinias, surely an error for Phainias.

and, further, that Aristotle was aware of what they were doing, and that there are passages in Aristotle which can be seen as replies to them.

The nature of the written work they did is uncertain. Flannery suggests that it is unlikely that Theophrastus wrote a commentary in the later, lemma by lemma, fashion.¹¹ Rather, he may have written an independent presentation of the syllogistic. But none of this helps us about Eudemus.¹²

The main subject on which they differed from Aristotle was modal logic. It is well known that Aristotle's account was unsatisfactory, and they tried to improve it. Aristotle introduced the idea that syllogisms could be modal, i.e., have premises and conclusions which included words like "necessary" and "possible," so that one could have "syllogisms" like: "Some geese are necessarily silent": "possibly no crows are geese"; "therefore no crows are silent"—which is clearly invalid, but indicates the possibilities. Many rules are obvious: you cannot have a necessary conclusion unless at least one of the premises is necessary, and you cannot have a valid modal syllogism unless the corresponding assertoric syllogism is valid. But other cases are not so easily resolved. One major problem was the interpretation of what is often called an assertoric proposition, i.e., one in which neither "necessary" nor "possible" nor any other modal term is involved; a second about the conversion of certain premises, i.e., when it was possible to exchange the subject and predicate terms and still get a true proposition, e.g. if necessarily no As are B, is it true that necessarily no Bs are A?; and a third that of what a conclusion would be where two different modal terms occurred in the premises. We are fortunate in having the evidence of Alexander here, but unfortunate in not knowing what his sources were. Did Theophrastus and Eudemus write a book together? It may be rel-

¹¹ Flannery (1995) 29 and n. 73.

¹² It may be relevant that there is considerable doubt about certain works on mathematics: Diogenes Laertius, *Lives of the Philosophers* 5.50 and 5.48, attributes to Theophrastus *Researches (Histories)* on both Arithmetic and Geometry (264 FHS&G. 2 and 3), though in the case of the former there is some uncertainty about the text. But Porphyry, *On Ptolemy's Harmonics* p. 115.4–5 Düring (142W), attributes an *Arithmetical Research* to Eudemus, and Proclus, *On the First Book of Euclid's Elements* prop. 26 theor. 17 (134W), Eutocius, *On Archimedes' On the Measurement of the Circle* p. 228 Heiberg (139W), and Simplicius, *On Aristotle's Physics* p. 60.22–31 (140W) attribute *Geometrical Research* to him. Since we have nothing from any work by Theophrastus in this area we can go no further, but it is at least possible that the two also cooperated on mathematical matters.

evant that Galen (73 FHS&G)¹³ lists under “On the works relating to Aristotle’s Philosophy” first some on Aristotle’s own works, then two almost certainly about works by Theophrastus, then *On the First Mover (Itself) Unmoved*,¹⁴ without attribution, then on Eudemus’ *On Style* (or *On Expression*), and then four more or less logical works of which the middle two are *On Problematic Premises and Syllogisms* and *On Syllogisms with Mixed Premises*; these are on the subjects on which Theophrastus and Eudemus collaborated: could Galen have been writing about works of joint authorship? (The other two are *On Proofs Connected with Why* and *On Sophisms Based on Language*, a work which is extant. This may contain a quotation from Eudemus (29W), but see Fortenbaugh in this volume.)¹⁵ Alternatively, did they work out their views in conversation? If so, someone must have recorded their conclusions. Presumably Alexander knew their joint book, or knew books by each of them which he found to contain the same teachings, or else someone before him recorded their agreement on evidence then available. We shall see later that possibly others joined in such arguments.

Another misfortune is that we no longer have Alexander’s own specialised work, *On the Difference (or Disagreement) between Aristotle and his Colleagues about Mixed (Premises)*, to which he refers several times for further information. We should not press this title, but it could mean that there were arguments between these parties, Aristotle and his colleagues, in person. Undoubtedly Alexander had material now lost. For Theophrastus we have a number of titles bearing on syllogisms, but the only one from which we have much material is his *Prior Analytics*.¹⁶ This title in itself raises difficulties. It can only, surely, have been applied in imitation of the title applied to Aristotle’s work, and it seems unlikely that all this would have happened before the death of Aristotle. His works can only have been entitled *Prior* and *Posterior Analytics* in a systematization of them, and this could well have been part of the work of his editors faced with the mass of his “papers.” It is perfectly possible, however, that the views with which we are concerned were established in some form long before Theophrastus wrote his own *Prior Analytics*, though I am inclined to

¹³ *On His Own Books* 14 (p. 123.1–9 Mueller).

¹⁴ The translation of this title is uncertain.

¹⁵ Chapter 4, Section I.

¹⁶ See Flannery (1995, 29 n.73) for some points about this.

think that Alexander knew his work only through that. What work if any he knew of Eudemus he does not say. He does indeed, as we have seen, refer to a work called either *Eudemian Analytics* or Eudemus' *On the Analytics* (9W), but oddly enough he mentions it only for remarks about dialectic. The double title itself is puzzling: the first reminds us of the *Eudemian Ethics*, but speculation here would be pointless, and the second again suggests a work written after Aristotle's material had been organised under that name.

A question also arises about his *On Style* or *On Expression*. Alexander,¹⁷ apparently followed by a scholiast (27W), for which see Fortenbaugh in this volume,¹⁸ refers to the first book of that work for Eudemus' views on the nature of the verb *esti* in a proposition. This relates to Aristotle's remarks in the *De interpretatione* 10 19b19, and at *Prior Analytics* 1.1 24b16–18. The subject is primarily logical, and we know very little of other contents of this work. One should note the claim by the Anonymous Coislinianus *On Aristotle's De interpretatione* p. xxiii.34–36 (CAG 4.5 Busse = 71G FHS&G) that some writers had produced an *On Style* in place of the *Categories*, but that seems improbable for Eudemus.

We have, I think, enough evidence to make it reasonable to pursue the suggestion that Theophrastus and Eudemus argued about logic during Aristotle's lifetime, and that he knew their activities. I propose to study three areas: some actual statements of Aristotle, some silences in Aristotle, and some evidence from Alexander and other later writers.

First, there are some passages in Aristotle's *Prior Analytics* which have been queried by modern editors. It is a feature of many of his works that they contain odd passages which seem at best irrelevant to their context, and various solutions to this problem have been put forward. It is possible that the first editors, who may have included Theophrastus and Eudemus, found "notes" in the margin of a papyrus, or lying around somewhere, and tried to fit them into the main text at a suitable place. If so, such notes are likely to have been composed independently of, and probably later than, the main text—such notes, indeed, that might have been made by Aristotle in the course of arguments with Theophrastus and Eudemus. Secondly, in at least one case there is an odd silence in Aristotle which, on the evidence of later writ-

¹⁷ Alexander, *On Aristotle's Prior Analytics* p. 16.15–17 (26W).

¹⁸ Chapter 4, Section I.

ers, may have been filled by colleagues of his other than Theophrastus and Eudemus. Thirdly, I shall also consider the possibility that Aristotle left some arguments which are not to be found in the *Prior Analytics*. Just possibly these were reported by Theophrastus or Eudemus along with their own arguments.

I digress on to a topic that has worried me for some time. Most people, in reading Aristotle's *Prior Analytics*, or Alexander's commentary thereon, must surely find themselves reaching for pen and paper in order to jot down complicated arguments in some kind of symbolism. But Aristotle made only limited use of symbols, and it seems probable that Theophrastus and Eudemus managed to think about expressions like "a combination in the third figure with the minor premise assertoric universal affirmative and a problematic particular negative major," and could argue about them. With practice this does become easier, but it is still difficult to suppose that such things were just committed to memory. There must have been discussions and records: presumably it was possible to concentrate on agreed points of difference and use some kind of short reference. But many objections involve examples, and although these are frequently given with just a statement of terms in our material, they must have been worked out to be effective. In addition, there are some examples of a sophisticated kind that surely must have been discussed. Such are those given at p.198–9 Wallies¹⁹ and discussed below, like "No rational thing of necessity does not think (N non AeB), for God is rational and thinks of necessity, and men also think, but not of necessity, but nothing rational of necessity does not think." This is aimed at the definition of the possible as that which is neither necessary nor impossible: for we have here some things which are necessarily so, and some which just are so: how do we classify these? This and the other cases given have been thought up with care, and one can imagine them being discussed in a group.

The following are places in the *Prior Analytics* where it has been suggested by at least one person that a passage is not the work of Aristotle: 1.3 25b19–24, 1.13 32a21–29, 1.13 32b4–22, much of 1.15 34b2–35b22, 2.3 55b6, 7–9 and 2.7 59a32–41, the last two concerning conclusions from false premises, and reciprocal proof in the third figure, which Ross (1957) finds erroneous and ascribes to some scholiast, and which may be ignored. But the remainder are on modal logic. Most

¹⁹ Wallies (1883) 198–99 (103B FHS&G).

of these have been suspected by Becker (1933), who wrote a whole book on Aristotle's treatment of possibility, and it could be because of his attention to these particular matters that this subject predominates here, but some at least of these passages may be relics of Aristotle's arguments with Theophrastus and Eudemus. 1.13 32a21–29, however, which Ross and others have athetized, although it is in all MSS and in Alexander and others, should probably be abandoned. It is on the meaning of *endechomenon*, and appears to contradict the immediately preceding account of that term.²⁰

A.

I propose to explore one case in detail: that of *Prior Analytics* 1.9 30a15. Here Aristotle turns to cases of mixed modal syllogisms; he says that sometimes, with a necessary major and an assertoric minor premise (a), the conclusion will be necessary. But the only argument he gives is that (if B belongs to all C) C is *ti tôn* B—something of the Bs. He then turns to syllogisms with assertoric major and necessary minor (b) and gives arguments that the conclusion here cannot be necessary, using first something like a *reductio* argument, not set out in full, and then examples of terms where the suggested syllogisms are clearly wrong.

Alexander in commenting on this²¹ first summarises the whole passage and then says that Eudemus and Theophrastus (note the order, but this is the only place where Eudemus comes first) rejected Aristotle's first claim (a) because of what is known as the *deteriorem* or *peioorem* rule, that with mixed premises the conclusion must agree with the weaker of the two premises: if there is an assertoric premise with a necessary one the conclusion must be assertoric, and similarly if a pair contains a possible premise the conclusion can only be possible. They gave first a (weak) inductive argument that the point held for the relations between affirmative and negative premises, and between universal and particular premises, and so should apply here. But in the case of Barbara NXN there was also a "separation" argument which Alexander reports concisely (I pause to remark that in translating the Greek I have tried to stick as closely as possible to the original. Many translators, for their own good reasons, interpret as well as translate: this can be misleading, appearing to support their own views about Aristotle):

²⁰ See Mignucci (1969) 295–96.

²¹ Alexander, *On Prior Analytics* 124.8–30 (11aW = 106A FHS&G).

“If the B belongs to all the C, but not of necessity, it is possible for it sometimes to be also (*kai*) separated (*apozeuchthênai*) from it. When the B is separated from the C, then the A too will be separated from it.” (A, of course, was assumed to belong necessarily to all the Bs?)

A fuller form of this comes from Philoponus’ *On Aristotle’s Prior Analytics* 124.11–23 (106D FHS&G), who attributes it to the colleagues of Aristotle:

“Necessary is what belongs to all and always, [just] belonging to (*huparchon*) is what is in the thing (*pragmati*) but can depart from (*apogenesthai*) it. If B does not necessarily belong to C, it can be separated from it. But if B is separated from C, A will not of necessity belong to C. [. . .] For, they say, you supposed erroneously (*kakôs*) that if A belongs necessarily to all (*panti*) B, and C is a part of B, A will necessarily belong to every C. For it belongs to all its proper (*kuriôs*) parts of necessity, but not to those which are sometimes parts of it and sometimes not. And B belonged to every C, but not of necessity, so that it can also not belong, for this is the nature of [just] belonging, to belong, but to be able not to belong.”

How much of this comes directly from Eudemus and Theophrastus we cannot say. But it is worth noticing the dramatisation (“You supposed erroneously”), which might reflect actual argumentation.²² What the passage adds to Alexander is the sentence about *huparchon*, and what seems to be an attack on Aristotle’s view that “B belongs to all C” means that C is a part of B. This reference is not easy to pin down in Aristotle, who does not use *meros* or *morion* or any similar word in this connection; at 1.25 42a10 he may be claiming that he has already proved it: “then something must be related to another as whole to part, for this has been shown earlier, that when there is a valid syllogism it is necessary for some of the terms to be like this,” but other interpretations are possible. One might also argue that to say that C is *ti tôn B* (something of the Bs) as we saw he did at 1.9 30a22, is more or less equivalent.

Alexander then reports three examples adduced by Theophrastus and Eudemus to show the invalidity of Aristotle’s syllogism in (a), (Barbara NXN) of which I will give the first:

²² In the section we have omitted from 106D FHS&G, at 123.26–124.8, the views of supporters of Aristotle are also given in a dramatized form. I consider later whether there were gatherings of such supporters and opponents, who included Theophrastus and Eudemus, but it is possible that the dramatization is Philoponus’ own. 106F FHS&G, from Pseudo-Ammonius (40.2–16, 37–40), is also dramatized.

"If animal belongs necessarily to every man,
 If man in fact belongs to every moving thing (at some time),
 (It is not true that) animal belongs necessarily to every moving thing."

These examples all have one premise which involves a definitional truth, e.g., All men are animals, and for that reason is necessary, and a second which could be true on occasion but is often false, e.g., All moving things are (at the present time) men. They lead to a proposed conclusion which is clearly unacceptable, e.g., All moving things are necessarily animals.

At 124.30 Alexander apparently endorses the views of Theophrastus and Eudemus, and with a *gar* (for) gives an extra comment of his own. At 125.3 there is a textual problem: the editor, Wallies, suggests adding *atoron* (stupid) either at the beginning or in line 6, giving then an attack on the suggestion that in this passage Aristotle used *pote* (sometimes) about the "matter," i.e., terms involved. That could have been a view of some expositor of Aristotle, but could not be by Theophrastus or Eudemus. Alexander attacks it with his own arguments ending (125.31) with a reference to his own *On Mixed Premises*.

Let us now look at the next passage of Alexander 126.9–17 (not given in FHS&G).

"Of those who support his (Aristotle's) view, some want to take the assertoric universal affirmative (AaB) in such a combination as true, not as a hypothesis, but truly being the case. For in that way (i.e., as a hypothesis) the premise becomes a postulate, and not yet true. But if it is taken as true in being the case and universal, what is said will not be proved false with any subject-matter. For 'Man belongs to every moving thing' is not true as belonging universally; nor again 'Literate to all men' nor 'Walking to all men.' With the assertories taken in this way, by the fact that they are not taken as universally true, the conclusion is not necessary."

What follows (126.17–22) seems to be Alexander's reply to these supporters of Aristotle, of whom we are not told who they are: "and yet what will they say when the minor is taken as no longer universal assertoric, but as particular? For in this way, if the major is necessary he (Aristotle) says that the conclusion is necessary, and it is no longer possible to say that the particular assertoric is not true—'Man of some walking thing,' or 'Literate of some man'? (i.e., a syllogism of the form: Necessarily all men are animals, Some moving things are men, Necessarily some moving things are animals)."

Unlike the conclusion “All moving things are animals,” which will only be true accidentally, this can always be true. Cf. *Prior Analytics* 1.9 30a38–b1, where Aristotle sets out this case.²³

Alexander turns to another group of Aristotle’s supporters (126.23–28), whose views are interesting but must not detain us here. They appear to be introducing prosleptic premises, which Theophrastus discussed, but Eudemus is not mentioned in that connection.

Yet a third group appear at 126.29–127.2, given at 11bW = 106C FHS&G. Alexander opens with a *reductio* argument given by Aristotle’s supporters which uses a position held to be valid also by Theophrastus and Eudemus. He then adds a *reductio* argument in the third figure which seems to be his own, and which also brings in an agreement with Theophrastus and Eudemus. Flannery²⁴ finds hints in this section of Alexander that he does not regard the arguments that he gives in support of Aristotle as fully convincing. At 127.15–16 he indicates his uncertainty by referring to *en allois* (in other works), which here probably means *On Mixed Premises* again.

We have seen, then, Alexander dealing with three groups of supporters of Aristotle, all unidentified. It seems possible that some of these, if we can take Alexander’s story literally, were people replying directly to Theophrastus and Eudemus, even perhaps during Aristotle’s lifetime. We can perhaps get further with a reference to Theophrastus and Eudemus and the Platonists at Pseudo-Ammonius *On Aristotle’s Prior Analytics* 45.42 (13W = 103C FHS&G), 49.9–10 (14W = 103D FHS&G), and 38.39 (11cW = 106E FHS&G), and Philoponus 123.15 (11dW = 106D FHS&G).²⁵ If we suppose that this means a Platonist, or more than one, who was a contemporary of Aristotle and Theophrastus and Eudemus, our field is limited. Speusippus died in 339, which is rather too early, and Polemon was not interested in logic. Of Xenocrates’ (396–314) logic we know little, but he did write ten books of solutions of logical(?) problems (*Lusis tôn peri tous logous*,

²³ There is some doubt about whether this section is Alexander’s own reply. Flannery (1995, 75 n. 67) refers to Maier’s view (1900) that 126.18–22 was Alexander’s own position, but rejects this claim himself.

²⁴ Flannery (1995) 71 and n. 54.

²⁵ The Platonists are usually referred to as *hoi apo Platônos* but frequently by Pseudo-Ammonius *On Aristotle’s Prior Analytics* 45.42 (13W = 103C FHS&G), etc. as *hoi Platônikoî*. At p. 65.14–15 they are again linked with “his colleagues.” Flannery (1995, 60 n.15) discusses later Platonists.

Diogenes Laertius 4.13) and he is the most likely candidate, but presumably there were other followers of Plato unknown to us. We may have here an echo of a dispute that stretched over both Lyceum and Academy in Aristotle's lifetime.²⁶

If we take the passages in 106 FHS&G as absolutely accurate, we can argue as follows: in 11cW = 106E FHS&G Pseudo-Ammonius has a set of leaders, Aristotle on the one hand, and Theophrastus, Eudemus, and the Platonists on the other. He says that Alexander and Iamblichus followed Aristotle, but Themistius, Syrianus and Proclus the others. This suggests, though it does not prove, that the Platonists were nearer in date to Aristotle than to Alexander.

There are also Platonists at Pseudo-Ammonius *On Aristotle's Prior Analytics* p. 58.19–23 (app. 102A FHS&G); this is about the conversion of a universal problematic negative, and I postpone discussion to part B.

Further, in 11dW = 106D FHS&G Philoponus reports that Theophrastus and Eudemus replied to a *reductio* argument used by some supporters of Aristotle, though not by Aristotle himself. This is in essence the same as what is reported by Alexander at 11bW = 106C FHS&G. We may suppose, then, that in Aristotle's lifetime there were discussions about his views, and that the *reductio* argument(s) were put forward by contemporaries of Theophrastus and Eudemus.

Let us sum up. Aristotle wrote a rather terse passage about mixed modes on which Alexander and others wrote at length reporting the views of other logicians. Of these Eudemus and Theophrastus together, and some Platonists, are named, and a variety of arguments both for and against Aristotle are given. We have seen that Aristotle himself gives an inadequate argument for his first point, but Alexander and Philoponus say that some people (*tines*) do introduce a *reductio* argument. Here there is a silence on the part of Aristotle which may have been filled by some contemporaries.

Even more interesting is the fact that at *Prior Analytics* 1.15 34b7–18 Aristotle has an argument which could be seen as a reply to his colleagues. This follows immediately a passage of a few lines (34b2–6) which Becker (1933), Ross (1957) and Mignucci (1965) have rejected as spurious, because it does not make sense. It has been taken to be a later gloss, but it was known to Alexander. It may be a sign of disrup-

²⁶ Flannery (1995, 65 n. 33) raises this question.

tion at this point, and what may be Aristotle's reply to Eudemus and Theophrastus could have been added just after it as at a convenient place in his already written manuscript. In the genuine passage before the spurious one Aristotle is concerned with Barbara with assertoric major, problematic minor, and problematic conclusion (**XMM**), i.e., A belongs to all Bs, possibly B belongs to all Cs, therefore possibly A belongs to all Cs. At 34b7–18 he adds that "A belongs to all Bs" must be always true, not true *kata chronon*—at some time (only), because otherwise the problematic conclusion may not follow:

"We must take the "belonging to all" not limiting it *kata chronon* as to now, or 'at this time,' but absolutely . . . for if we take the premise as referring to the present there will not be a (valid) syllogism. For possibly nothing prevents on occasion man belonging to every moving thing, for instance if nothing else were moving. And it is possible for moving to belong to every horse, but it is not possible for man to belong to any horse."

The first syllogism he rejects is:

Man belongs to every moving thing (at some time),
Possibly moving may belong to every horse,
But not: Possibly man may belong to every horse.

He gives terms for another:

Animal belongs to every moving thing (at some time)
Possibly moving may belong to every man
But not: Possibly animal may belong to every man—because animal necessarily belongs to every man.²⁷

Bocheński assumes that Theophrastus, when giving his examples, did not know this passage of Aristotle.²⁸ If he is right, that could be either because it was not authentic, but added later by someone other than Aristotle, or because Aristotle wrote it in reply to Theophrastus. In favour of the latter possibility is the fact that Aristotle's example, "Man belongs to every moving thing" is identical with part of the first example given by Theophrastus.

²⁷ Ross's criticism (1957) of this example is answered by Mignucci (1969, 327).

²⁸ Bocheński (1947) 81.

B.

Here we have a case where Alexander reports arguments supposed to have been put forward by Aristotle in reply to Theophrastus and Eudemus, but which are not in our text. One big point on which Theophrastus and Eudemus disagreed with Aristotle is the meaning of “possible” (*endechomenon*). There are two primary possibilities, to treat it as equivalent to not impossible, or not necessarily not, or as equivalent to neither impossible nor necessary. Aristotle, at least in the systematic treatment found in the *Prior Analytics*, preferred the latter, two-sided interpretation, while Theophrastus and Eudemus preferred the former, one-sided way. Aristotle had a problem, for while he found that he could use the two-sided type in the premises of a syllogism, sometimes he had to accept that a valid syllogism could result only if the conclusion was of the one-sided type. The most commonly held view of Theophrastus’ and Eudemus’ work is that by adopting the one-sided type they brought considerable simplification into Aristotle’s system.

We must begin with the categorical syllogism, for here the main area in which Theophrastus and Eudemus are reliably reported to have agreed is in the conversion of “A belongs to no B” and “B belongs to no A.”²⁹ This is relevant because they went on, in modal logic, to differ from Aristotle not merely in the proof given, but in the actual facts: they opposed Aristotle about the conversion of problematic universal negative propositions like “Possibly A belongs to no B” (**M AeB**). Aristotle held that “Possibly A belongs to no B” does not convert to “Possibly B belongs to no A” (**M BeA**) but only to “Possibly B does not belong to some A” (**M BoA**). On the other hand he wanted to be able to convert “Possibly B belongs to no A” (**M BeA**) to “Possibly B belongs to all As” (**M BaA**), and “Possibly A belongs to some B” (**M AiB**) to be equivalent to “Possibly A does not belong to some B” (**M AoB**). Ross has called this complementary conversion. A passage at *Prior Analytics* 1.17 36b35–37a4, in spite of some obscurity, seems to amount to this:

M AaB is equivalent to **M AeB**

M BaA is equivalent to **M BeA**

²⁹ See Alexander, *On Aristotle’s Prior Analytics* 31.4–10 (90A FHS&G) and Philoponus *On Aristotle’s Prior Analytics* 48.11–18 (90B FHS&G).

But if **M** AeB is equivalent to **M** BeA
 we would have a circle with
M AaB equivalent to **M** BaA,

which Aristotle, and nearly all commentators, reject, though, as Martha Kneale says,³⁰ it is rather a weak argument. In any case it only shows that you cannot have both **M** AaB as equivalent to **M** AeB and **M** AeB as equivalent to **M** BeA. Aristotle chose one alternative, and Theophrastus the other.

To defend their approach Theophrastus or Eudemus or both used a form of the “separation” argument which they had already used, as we have seen, to prove AeB is equivalent to BeA. The new form went:

“Since it is possible for A to belong to no B, *when* it is possible for it to belong to none, it is *then* possible for A to be separated from all the Bs, and, if so, *at that time* the B will be separated from the A and, if so, the B will possibly belong to no A.”³¹

Pseudo-Ammonius reports this of the Platonists at 58.19–23. Alexander later gives a second argument, attributed to Aristotle’s colleagues (223.5–14 102B FHS&G):

“If A possibly belongs to no B (**M** AeB), B too possibly belongs to no A (**M** BeA). For if this is false, the opposite is true: but the opposite of ‘possibly belongs to none’ (**M** _e_) is ‘does not possibly belong to none’ (non **M** _e_), which seems to be equivalent to ‘of necessity belongs to some.’ B, then, of necessity belongs to some A. But since the particular necessary affirmative converts, A too of necessity belongs to some B, which is impossible; for it was supposed that A possibly belonged to no B, according to the sense of ‘possibly’ which is according to the definition. If indeed this is impossible, the hypothesis from which it followed is also impossible. That was that B belongs of necessity to some A, which was substituted for ‘does not possibly belong to none.’ The opposite then is true, that B possibly belongs to no A.”

Alexander adds: “It is this proof that Aristotle attacks as not being valid.” And back at 220.18 (102A FHS&G) he purports to give Aristotle’s reply to the two arguments, first to the separation or disjoining argument (a):

“It is not the case that if something has been disjoined from something, it has also been disjoined from it *in the problematic mode*; hence to show that, when

³⁰ Kneale (1984) 87.

³¹ Alexander 220.9–16 16W = 102A FHS&G.

A may possibly be disjoined from B, then B too has been disjoined from A, is not sufficient to show this too, that it has also been disjoined in the problematic mode. But if this has not been shown, it has not been shown that the problematic converts, since that which is of necessity separated from something is also disjoined, but not in the problematic mode.”

Alexander goes on to give a further proof (b) supposed to have been given by Aristotle:

“... that it does not convert Aristotle shows using *reductio ad impossibile* too. If it is possible, suppose that it converts, and if A possibly belongs to no B, let B too possibly belong to no A. But it is assumed by us that negative problematics also convert with affirmative problematics: and it is assumed that B possibly belongs to no A. It is clear, then, that it also possibly belongs to all of it. But this is false: for it is not the case that, if A possibly belongs to all B, because it possibly belongs to none, as was assumed, it is necessary that B too possibly belongs to all A: for in this way it comes about that the universal affirmative problematic converts, which is not true even according to them (i.e., Theophrastus and Eudemus). Take at any rate this case: white possibly belongs to every man, because also to none, but yet it is not the case that man possibly belongs to all white things: for there are some white things to which of necessity it does not belong, like swan, snow, and a thousand others. And if it is false that man possibly belongs to all white things, it is false too that it possibly belongs to none. Hence it is not true that if A possibly belongs to no B, B too will possibly belong to no A; for it is not the case that what in fact belongs to nothing belongs to nothing in the problematic mode also.

Accordingly when they (Theophrastus and Eudemus) say that the universal negative is convertible in its terms, they are not also saying that the affirmative problematic converts with the problematic negative: for that is not possible, because according to them not only the problematic according to the definition will be [problematic].”

It seems likely that the last part is Alexander’s own contribution, but before that he claims to be quoting Aristotle. But what part of Aristotle? The first argument (a) uses the word “disjoin” (*apozeugnein*) which is not in fact used by Aristotle, and the alternative word “separate” (*chôrizein*) is also not used by Aristotle in this sense. So Alexander appears to be giving a criticism made by Aristotle which is not to be found in his work. The position is more complicated with the second proof, by *reductio* (b). Aristotle does give a proof of this kind, but its text and interpretation are uncertain. At *Prior Analytics* 1.17 36b35ff., the passage discussed above (p. 98–9), Aristotle is concerned with syllogisms in the second figure with both premises possible, like possibly all As are B; possibly all Cs are B (M AaB, M CaB). He says that he needs to

prove that it is not the case that if possibly no As are B, it follows that possibly no Bs are A. He argues that if possibly no Bs are A, then possibly all Bs are A. But from that it does not follow that possibly all As are B. This is clearly an incomplete proof, and Lukasiewicz and Mignucci³² differ over it, but it can plausibly be seen as similar to that given by Alexander. On the other hand Aristotle does not refer to Theophrastus and Eudemos, and the argument could be introduced here as required at this point, without their intervention.

So we are left with a question: did Aristotle give some proofs outside his written work, and were they recorded by Theophrastus or Eudemos in a work now lost? Or did Alexander produce them himself, or some predecessor of his? If the latter, we would expect him to have named that predecessor, which he does not. But the second proof at least could be based on *Prior Analytics* 1.17.

A word is necessary about 15W (102C FHS&G), from an anonymous work discovered and published by Menas, who was on an expedition to Mount Athos on which he found also Galen's *Introduction to Logic*. The Anonymous has been criticised for using the word *ecthetike* (expository) of a proof he ascribes to Theophrastus and Eudemos, but *ecthesis* is used in more than one sense by Aristotle.³³

I return here to the Platonists of Pseudo-Ammonius mentioned above;³⁴ this is about the conversion of a universal problematic negative (M AeB) which Aristotle says involves a universal problematic affirmative (M AaB). Pseudo-Ammonius gives a supposed discussion mainly between Aristotle and the Platonists, but once there is mention of the Peripatetics. This is in reply to a criticism by the Platonists of Aristotle's claim that while white may possibly not belong to all men it is not true that man may possibly belong to nothing white, because to some things it of necessity does not belong.³⁵ The Platonists say that one must distinguish between various whites, so that the white in swan necessarily does not belong to man. The Peripatetics come in here with a distinction between applying an extra qualification (*prosdiorismos*) to the subject and to the predicate. It may be only a coincidence that in

³² Lukasiewicz (1957) 194 and Mignucci (1969) 360–61.

³³ Flannery (1995, 30 n. 74) finds this point interesting. He has a long chapter on *ecthesis*.

³⁴ Pseudo-Ammonius, *On Aristotle's Prior Analytics* p. 57.22–58.23 (app.102A FHS&G).

³⁵ *Prior Analytics* 1.17 36b5–7.

a late scholiast (cod. Ambros. Gr. 490 f. 64^v) (84 FHS&G) Theophrastus refers to cases where the extra qualification does not apply to the predicate. If not, we may have more evidence for arguments in Aristotle's lifetime.

C.

There are two odd passages in Aristotle about probability which seem questionable. Theophrastus and Eudemus and the Platonists also had an argument against complementary conversion ("possibly no A is B" is equivalent to "possibly all As are B") given by Pseudo-Ammonius.³⁶ They objected that this did not preserve *to epi to polu* (the majority aspect).³⁷ This suggests that they held a statistical view of possibility (or probability), equating it with what holds usually but not always, an account important for science. On this view, if it is probably the case that A belongs to no B, it cannot be that it is probably the case that A belongs to every B. Our evidence on this is limited, but we can relate it to other matters: Aristotle³⁸ discusses various applications of *endechomenon* (possible) and at 25b12 adds: "what are said to be possible in the sense that they are usually or naturally so (*tôi hos epi polu*³⁹ *kai tòi pephukenai*)" and adds: "and this is the way in which we distinguish the possible." Ross and most others brush this aside as an oversight or a loose way of speaking, but it is an important sense, and important for Theophrastus because it does not fit complementary conversion. Aristotle again brings this sense in at 1.13 32b4–22 where he has two senses of the possible, this one and that which is a matter of chance.⁴⁰ It is a sore thumb in Aristotle, and that very fact suggests that he wrote these passages under the influence of his colleagues.⁴¹ Ross

³⁶ *On Aristotle's* Prior Analytics 45.42–46.2 and 49.7–12 (13, 14W = 103CD FHS&G).

³⁷ See also Pseudo-Ammonius *On Aristotle's* Prior Analytics p. 58.4–8.

³⁸ *Prior Analytics* 1.3 25a37–b25.

³⁹ There is a textual difference between our received text of Aristotle and that of Alexander. See Barnes et al. (1991) 96 n. 58.

⁴⁰ Barnes (1969, 133–36) indicates Aristotle's uncertainty on this matter, or at least the inconsistency of his surviving texts.

⁴¹ Diocles of Carystus, a Peripatetic whose dates have been argued over, is said to have operated with the notions of necessary for mathematics, *hôs epi to polu* for nature, and *sumbêbekos*. For recent discussion of his dates and influence, see H. von Staden (1992) 227–65.

(1957) says that this passage has no organic connection with the rest, but he still regards it as genuinely Aristotelian, but a separate note.

Pseudo-Ammonius⁴² gives us an example of what may have been Theophrastus' and Eudemus' thought with the case of being six-fingered: it is possible that no man is six-fingered *hōs epi to polu* ("looking at the majority") and it is possible that all men, and that some man, is six-fingered, *ep' elatton* ("with the minority"). The point of this itself is not clear, but it shows an interest in this area. Another piece of evidence may fit in here: the scholiast on Philoponus' *On Aristotle's Prior Analytics*⁴³ says that unlike Alexander and Philoponus, Theophrastus (Eudemus is not mentioned here) thought that "not belonging to all" (non AaB) differed from "not belonging to some" (AoB) in sense as well as in expression, so that the first indicates "belonging to many," and the second "belonging to one." The scholiast goes on to say that it is possible to find Aristotle putting first "not belonging to all" and inferring "not belonging to some" and again putting first "not belonging to some" and adding "or not all," and he did this through the lofty idea of Theophrastus. I have not been able to find this usage in Aristotle, and a late scholiast is not the most reliable of witnesses, but it is indeed true that at *Prior Analytics* 1.4 26a38 he adds a superfluous "or not to all," and at 26b5 "or if not to all" to a preceding "not to some." See also 1.1 24a19, where he adds "or not to all" to "to some or not to some" and 1.4 26b15-16 where he has "not to all," because "to some not." We can deduce little from this, but the point is worth making.

D.

Finally I consider a situation where it is possible that Theophrastus and Eudemus suggested some examples to help Aristotle out. *Prior Analytics* 1.15 is a messy chapter, and at 34b32 Aristotle tries to defend his argument by means of examples. But they are not very good, and he ends at 35a2 with: "but we must choose the terms better." Alexander says:

"If there can be found in some subject-matter (*hule*) a thing belonging necessarily to some, but not of necessity not belonging to some, with regard to that 'there is nothing to which of necessity it does not belong' (N non AeB) would be true, but 'it possibly belongs to all (*endechetai panti*)' not true, if at least

⁴² 45.42–46.2 (13W = 103C FHS&G).

⁴³ P. 145a30–37 Brandis (83 FHS&G).

what possibly belongs to all also possibly belongs to none, and it is false to say that what necessarily belongs to some may possibly belong to none.”⁴⁴

Alexander gives three examples of a subject of the kind described, of which he dismisses the first as unsatisfactory, but takes seriously the other two: of the second he gives two versions a) “no rational (*logikon*) thing of necessity does not think.” and “nothing having a mind (*noun*) of necessity does not think,” for if God is rational, thinking belongs to him of necessity, and not-thinking belongs to nothing rational of necessity. The second is “no physical body of necessity does not move in space, for motion belongs of necessity to the rotating sphere.” Whatever else is obscure, it is clear that these examples are used with an argument about the definition of possibility; as we have seen, Aristotle’s definition can be stated as a combination of what is not necessary and not impossible, whereas Theophrastus wants what is not necessarily not. At 199.8 those associated with Theophrastus are mentioned, though it is not clear how closely they are related to the examples.

If these cases come from Theophrastus they can be seen as examples thought up to show Aristotle that his theories of possibility contain hidden difficulties which could be demonstrated by finding awkward cases. Elsewhere,⁴⁵ Alexander is commenting on *Prior Analytics* 1.17 36b38–37a9 where Aristotle says that “possibly man belongs to no white thing” is false, because there are some white things (like snow and swans according to Philoponus⁴⁶) (which are necessarily white and therefore) to which necessarily man does not belong. This is all Aristotle says, but in commenting on it Alexander mentions several other examples of which the last concerns moving *kata phoran* (i.e., in space): man cannot belong to every moving thing, for man cannot belong to the rotating sphere: for it is of necessity that man cannot belong to that. This case involves the notion of necessary rotation or moving in a circle. At Philoponus *On the Eternity of the Universe* 13.15 520 (161A FHS&G) the notion of moving in a circle is attributed to Theophrastus. Barnes et al. (1991) think that a number of examples of terms given by Alexander are his own inventions, but that can hardly apply here.

⁴⁴ *On Aristotle’s Prior Analytics* p. 198.15–199.7 (103B FHS&G).

⁴⁵ *On Aristotle’s Prior Analytics* p. 222.7–12 (not in FHS&G).

⁴⁶ *On Aristotle’s Prior Analytics* p. 210.8.

In this last section I have mainly named Theophrastus, but it is perfectly possible to see Eudemos' hand here as well. I have even suggested that much might have been done in open argument, although there must have been at least some written work by Eudemos available to later writers.

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6

Eudemus' *Physics*: Change, Place and Time

Robert W. Sharples

1. The Nature of Eudemus' *Physics*¹

Eduard Zeller suggested² that Eudemus' *Physics* was an abridgement of the Aristotelian treatise, compiled by Eudemus for his own lectures when he left the Lyceum and set up his own school in Rhodes. We cannot I think prove this; but it seems plausible enough. It is clear that Eudemus followed the sequence of Aristotle's discussion closely; Simplicius used Eudemus' order of treatment to argue that the sixth book of Aristotle's *Physics* was rightly regarded as following on the fifth (Eud. fr. 98W).

¹ I am particularly grateful to those who have contributed to discussion of this paper at the conference in Budapest or by correspondence, especially Keimpe Algra, Han Baltussen, Sylvia Berryman, István Bodnár, Lindsay Judson, André Laks and David Runia, and to Han Baltussen for having let me see preliminary drafts of his chapter in this volume. The responsibility for any misuse I may have made of their advice remains, of course, my own.

² Zeller 1879, 871 n.4. Similarly Jaeger (1948) 36–56. But Wehrli (1968, 654; 1969, 87) says that we cannot be sure whether Eudemus' works derive from his time in the Lyceum or his subsequent period at Rhodes. He also notes that, unusually for a Peripatetic, there is no evidence for Eudemus having produced exoteric or literary works; his writing is purely for the school context.

Zeller (1879, 871–72 n.7) argued that, since the ancient citations of Books 1–3 of Eudemus’ work correspond to themes covered in Aristotle’s first six books, and since we know that Eudemus in following Aristotle’s sequence omitted Aristotle’s book 7 altogether, Eudemus’ treatise comprised only four books in all. Zeller was however under the mistaken impression (1879, 872 n.1) that Eudemus dealt with themes from Aristotle’s sixth book in his own *second* book, before going back to Aristotle’s fourth in his own third book (fr. 87W).³ In fact, however, Eudemus’ fourth book is several times cited in connection with Aristotle’s sixth (Eud. frs. 101, 104, 105W). This seems hard to reconcile with a Eudemian *Physics* containing four books in all; and so Wehrli (1969, 87–88) rightly argued that Eudemus’ work included a fifth book.⁴

Simplicius describes Eudemus (fr. 44W) as “following Aristotle in everything” (Martini 1907, 899). Zeller (1879, 871) comments that there is “scarcely any important departure” in Eudemus’ *Physics*, and again that “in the numerous fragments of his treatise we cannot fail to recognise a true apprehension of the Aristotelian doctrine, careful consideration of the different questions involved in it, and a skilful elucidation of many statements and interpretations; but we still look in vain in them for fresh scientific ideas or observations” (Zeller 1879, 872–3; Costelloe and Muirhead 1897, 420–1).⁵ It is perhaps worth noting here that Zeller, and also Martini (1907) who composed the original Pauly-Wissowa article on Eudemus, were writing at a time when it was generally assumed that the *Eudemian Ethics* was Eudemus’ work; that

³ Zeller was following Spengel, who argued for a four-book Eudemian *Physics* with book 1 corresponding to Aristotle’s books 1 and 2, 2 to Aristotle’s 3, 5 and 6, 3 to Aristotle’s 4 and 4 to Aristotle’s 8. Similarly Martini (1907, 900). But this is simply an error resulting from the fact that in Eudemus frs. 101, 104 and 105W, on Aristotle’s sixth book, the Aldine edition gives the Eudemian book number as δευτέρω, the MSS as τετάρτω (Simpl. *In phys.* 942.18–19, 989.27 and 991.30 respectively; indeed the source of the error may be revealed by the fact that in the first of these passages, while Diels’ MSS ACM spell out τετάρτω in full, MS F has the abbreviation δ’.) Spengel (1866) and Zeller (1879) can be excused for using the Aldine, for Diels’ edition of Simplicius’ *Physics* commentary was still in the future when they wrote; Martini, writing in 1907, ought perhaps to have checked. — I am grateful to Han Baltussen for discussion of the issues in this note.

⁴ Cf. Wehrli 1968, 655, and Sider 1981, 24. (I have not been able to consult Schöbe. I am grateful to Han Baltussen for drawing my attention to Sider’s discussion and to Schöbe.)

⁵ Similarly Martini 1907, 900.

supposition may have influenced their estimate of his *Physics* too. There has been debate about how far Theophrastus diverged from Aristotle in his physical theories, debate which in some cases, for example that of the doctrine of place, goes back at least as far as Zeller himself; in physics at least (unlike logic) Eudemos seems cast in the role of loyal and orthodox follower, by contrast with Theophrastus.⁶

True, even if Eudemos were simply abridging Aristotle's discussions without adding a single original thought of his own, there might still be interest in investigating, in so far as the evidence will allow,⁷ how he carries out this task; does he simply summarise Aristotelian arguments, or does he provide new ones of his own? Was his work a condensed paraphrase of the Aristotelian text, like some of the ἐπιδρομαί or summaries we find among the *Quaestiones* attributed to Alexander of Aphrodisias?⁸ Does he spell things out more fully than Aristotle, or cast arguments into more rigorous form, like later commentators when they set out the reasoning of a passage syllogistically? Does he add arguments of his own, or react to apparent objections?

For Aristotelians of the period of the Roman Empire the text of Aristotle is, as it were, canonical. The summaries attributed to Alexander are meant as an aid to the study of Aristotelian texts, not to supplant them. Eudemos, it seems reasonable to suppose, had a text of

⁶ Thus, in accordance with his general view of Theophrastus, Steinmetz (1964, 148) draws a contrast between, on the one hand, Theophrastus' *Physics*, which he argues was like Theophrastus' *Metaphysics* in raising problems for Aristotelian positions, and Eudemos' abridgement on the other. Eudemos and Theophrastus are similarly contrasted also by Wehrli (1969, 89; cf. 87), Algra (1995, 248, 258), and Gottschalk (1998, 291); Gottschalk notes that Theophrastus' inclusion of detailed discussion of soul in his *Physics* indicates a different approach from Eudemos' following the sequence of topics in the Aristotelian work. (However, explanation and systematisation were features of Theophrastus' *Physics* too; cf. e.g., Theophr. frs. 143–44 FHS&G with the comments of Laks 1998, 152, 161). Jaeger (1948, 365–66) suggests that, insofar as Eudemos was simply bringing Aristotle's *Physics* up to date in terms of the stage that discussion had reached at the end of Aristotle's life, additions in Eudemos, as compared with Aristotle's text, cannot be regarded as Eudemos' own.

⁷ And in so far as space permits; for these reasons attention is focused in the present discussion on Eudemos' treatment of issues relating to change, place and time, that is largely, though not entirely, issues raised in books 3–6 of Aristotle's own *Physics*.

⁸ E.g., *quaestio* 3.14; similarly, though without "summary" in the actual titles (which may in any case be later additions) 3.3 and 3.10. There are also ἐπιδρομαί which are summaries of doctrines rather than of a single text; e.g., *Ethical Problem* 25, *quaestio* 1.1.

Aristotle's *Physics* with him in Rhodes; at least, we know that he wrote to Theophrastus about the correct version of the text (fr. 6W = Theophr. fr. 157 FHS&G), and it is at least likely that it was from Rhodes that he did so. But if Zeller is right in supposing that Eudemus used his own text for his own teaching, are we to suppose that his pupils read Aristotle's text as well, so that Eudemus regarded his own teaching as essentially ancillary, or rather that, while Eudemus used his copy of Aristotle as a basis for composing his own work, and he and his pupils may occasionally have referred to it in discussion, essentially he saw his own treatise as *replacing* Aristotle's as far as teaching was concerned? Eudemus will then share with the later commentators the approach of "interpreting Aristotle through Aristotle"⁹ in order to elucidate Aristotle's thought and make it more systematic;¹⁰ but he will differ from them in regarding his task as one of presenting Aristotle's thought rather than Aristotle's text.

The state of our evidence may not allow us to answer all these questions. But they seem at least worth asking. Wehrli (1969) gives just over 100 fragments relating to Eudemus' *Physics*, if one counts "a" and "b" items separately; all but four of these are from Simplicius' *Physics* commentary,¹¹ frequently in the form of direct quotation of Eudemus by Simplicius. There is not space here to discuss each of these texts individually; I propose to concentrate on the part of Eudemus' discussion that corresponds to the middle books, 3 to 6, of Aristotle's *Physics*,¹² and to bring together texts that illustrate particular points about Eudemus' views and procedure.

For I think we *can* speak of Eudemus' views. Even in cases where he is following Aristotle, it is clear that he is not doing so slavishly or

⁹ Cf., for Alexander, Moraux 1942, xvi. André Laks has pointed out to me that to claim this for Eudemus involves his anticipating the procedure of interpreting Homer through Homer developed in Hellenistic Alexandria. Drawing connections between different parts of a single Aristotelian text, or between different texts, is a natural response to the presence of common themes running through Aristotle's writings — the existence of the 'metaphysical lexicon' in *Metaphysics* Δ demonstrates this.

¹⁰ There are indeed differences among the commentators; it may not be entirely fanciful to see the differences of approach between Philoponus and Alexander as in some ways echoing those between Theophrastus and Eudemus.

¹¹ The exceptions are: fr. 49 from Plutarch, *On the Generation of the Soul in the Timaeus*; fr. 71 from a scholion on Aristotle; a parallel to Simplicius from Themistius in fr. 80; and fr. 89 from Diogenes Laertius.

¹² On the topic of place see especially the discussion by Algra (1995, 248–58).

unthinkingly. Zeller indeed noted one and — he says explicitly — *only* one disagreement between Eudemus and Aristotle on a point of doctrine in physics. At *Physics* 3.1 201a8–9 Aristotle suggests that there is change in all the categories. He appears to modify this position later, at 5.1 225b5ff., 5.2 226a23ff.¹³ Simplicius however himself adopts the view that there is change in all the categories; he cites passages from Theophrastus (fr. 153ABC FHS&G) in support of this claim, and also appeals, in commenting on the passage from *Physics* 3.1, to his own earlier claim that Eudemus recognised change in the category of “when”:

I know that it seems rash to state the opposite position to Aristotle, but until we can know accurately the reason for his adopting this arrangement, we will be sufficiently reassured by the advocacy of Eudemus in relation to the category of “when”, and still more by that of Theophrastus, who clearly considers change and transition in all the categories. (Simpl. *In phys.* 412.31ff. = Theophr. fr. 153B FHS&G = Eud. fr. 59W)

The reference is to 411.10ff. (also in Eudemus, fr. 59W) where Simplicius had argued that

one should recognise that time is constantly acting on us, and as with changing from white to black, so the transition from last year's condition to this year's is not from condition to condition, for example from youth to old age, in accordance with a different disposition of the body; rather, it is according to the temporal significance of what belongs to last year and what belongs to this. Support is given to the argument also by Eudemus, most genuine of Aristotle's followers,¹⁴ when in the second book of his *Physics*, after stating the other four movements, he says ‘for the “when”, too, applies to things that have a capacity when they are moved in respect of that capacity. For it is in time that all changes occur.’

Zeller (1879, 871 n.6) interprets this as a claim by Eudemus that change in time, quite apart from any qualitative change involved, is to be added to the four standard kinds of change. Simplicius, too, interprets what he quotes from Eudemus as supporting his own claim that there is change in the progression from last year to this year, from ear-

¹³ Steinmetz (1964, 152) suggests that what is said in 3.1 is only an initial debating position.

¹⁴ Cf. also fr. 105W, where Simplicius describes Eudemus as “understanding Aristotle's view more than any other of the commentators” — in connection with the particular point at issue in the passage in question, or more generally?

lier to later, quite *apart* from any other type of change going on. It is however far from clear, as Wehrli (1969, 99) points out, that there is this implication; and if not, it may look as if Eudemus has now lost his one claim to an original physical doctrine. He may indeed be better off without it. For Simplicius' position prompts the familiar retort "well, how fast does time pass, then?" — at which point we are launched on the regress of a second time in terms of which the first can pass more or less quickly, and so on.

Simplicius' claim that *Theophrastus* recognised change in all the categories is at least questionable; some at least of his use of quoted passages from Theophrastus seems as tendentious as that of the passage from Eudemus with which we began (see on this Sharples 1998, 72). Theophrastus did however clearly — unlike Aristotle himself (*Phys.* 5.2 225b11–13) — allow change in the category of relation, at least in the case of relations which he described as in respect of a capacity (δύναμις), as opposed to those in respect of a proportion (λόγος). (Simpl. *In phys.* 413.8–11 = Theophr. fr. 153B FHS&G, third quotation). Eudemus, however, regarded change in the category of relation as purely accidental, illustrating this by Cambridge change (the two-cubit length becomes double if a one-cubit length comes to be: Eud. fr. 93aW).

2. Compression and Expansion

There are occasions where Eudemus' exposition is simply a compression of Aristotle's; for example, the argument in Eudemus (fr. 101W) that time and motion must both be divisible since it is possible to traverse the same distance at a faster or a slower speed. Eudemus summarises here what Aristotle spells out with detailed workings (*Phys.* 6.2 232b20ff.).¹⁵ Elsewhere, though, we find Eudemus adding points to what is in Aristotle.¹⁶ Sometimes, indeed, it seems to be simply a matter of fuller exposition; thus we may compare Eudemus' argument in fr. 85 that time and change are continuous, because length is, with Aristotle's briefer argument at 4.11 219a10–14.¹⁷

¹⁵ As examples of compression in Eudemus Wehrli (1968, 656) cites fr. 73, 74, 79, 80, 120; see further below.

¹⁶ Cf. Wehrli (1969, 88), citing fr. 33, 35, 36, 54, 68, 75 (below), 77; also id. (1968, 656), citing 36, 64 (below), 76, 99 (below), 100 (below).

¹⁷ Wehrli (1969, 105) refers to Eudemus' "higher stylistic aspirations" here. Strato

In *Physics* 4.1 Aristotle lists a number of problems concerning place. One, at 209a18–22, is that place cannot be a cause, in any of the four Aristotelian senses of “cause”. Eudemus (fr. 75W) expresses his rejection of place’s being an efficient cause as a challenge to Democritus, who is addressed in the vocative;¹⁸ the point being, as Simplicius points out, that place for Democritus was void, and presumably also, though Simplicius does not spell *this* out, that void for Democritus was a cause of the movement of atoms by making such movement possible.¹⁹ Duhem insisted that place was a formal cause for Aristotle himself,²⁰ and Sorabji (1988a, 186–7; 1988b, 139, 160 n.6) holds that it was a final cause;²¹ against this Algra (1995, 195–221) argues that it is not the place, but being in it that is the cause, and that Eudemus at least, in our text, regards it as *generally agreed* that place is not a cause (Algra 1882, 151–2; 1995, 252–3).

At *Physics* 3.4 203b10ff. Aristotle lists a number of reasons for belief in infinity, including, at 203b20–2, the argument that what is limited must always be limited by something beyond it. Eudemus (fr. 65W) makes the point more vivid by citing Archytas’ dilemma of the person

denied that time is the number of motion, on the grounds that time and motion are continuous while number is discrete; Simplicius contrasts him in this connection with Theophrastus and Eudemus, “who clearly held and taught the same opinions as Aristotle concerning time” (Simpl. *In phys.* 788.34ff. = Theophr. 151B FHS&G = Eud. fr. 91W = Strato, fr. 75W).

¹⁸ Wehrli (1969, 103) here compares Eud. fr. 37. He refers to “der diatribenhafte Ton” (1969, 88; cf. 92); but as Keimpe Algra points out to me, not only is the application of the term “diatribe” to specific ancient texts problematic in itself, but also its usefulness in singling out just a single stylistic feature, as here, may be questioned. See below, n. 31.

¹⁹ So, against Democritus, Aristotle at *Phys.* 8.9 265b23; cf. 4.8 214b16; Wehrli loc. cit.; Guthrie (1957, 40–1 = 1965, 398–9 and 398 n.2); and Algra (1995, 250–51), who notes that Eudemus in our passage is taking over the strategy Aristotle uses against the atomists in these other contexts, and contrasts *GA* 2.6 742b17ff., where Aristotle represents Democritus as saying that what is always so has no cause. Aristotle finds this objectionable, but it may be a more accurate reflection of Democritus’ actual position.

²⁰ Duhem (1913, 208–9), citing Arist. *De caelo* 4.3 310a33–b1, τὸ δ’ εἰς τὸν αὐτοῦ τόπον φέρεσθαι ἕκαστον τὸ εἰς τὸ αὐτοῦ εἶδος ἐστὶ φέρεσθαι. Cf. however, against the claim that this passage identifies natural place with form, Algra 1992, 150 n. 23.

²¹ Sorabji dismisses 4.1 209a18–22, cited above, as purely aporetic. Algra (1992, 149–50) objects to this that Aristotle nowhere asserts that place is a cause, the claim at 4.1 208b8–11 that it has a δύνανμις equally being only one of the preliminary φαινόμενα introductory to the discussion proper. Cf. Sorabji 1998, 210.

at the edge of the universe — can he poke a stick further out, or not? Either way, he cannot be at the edge. According to Simplicius Eudemus recognised six arguments for the infinite²² where Aristotle (*Phys.* 3.4 203b15ff.) distinguishes five; the difference, it seems, is one of arrangement rather than of doctrine.

Aristotle cites (*Physics* 4.6 213b21), as an argument for the existence of void, the fact that a vessel full of ashes will hold as much water as would the same vessel empty. He himself responds by arguing, at 4.7 214b3ff., that this argument, like that from increase by rarefaction, runs into logical difficulties. Eudemus however (fr. 81W) goes further in explaining why the phenomenon occurs: there is heat in the ashes which vaporises some of the water. The presence of heat is shown, he says, by the burning effect of water that has been filtered through ashes — i.e. lye (caustic soda, sodium hydroxide). The effect of the heat in ashes on their flavour is noted elsewhere by Aristotle and linked with their effect on the taste of water filtered through them;²³ but it seems to be Eudemus' personal contribution to use the point to counter the use of the behaviour of water and ashes as an argument for void. As Ross notes (1936, 583; Wehrli 1969, 104), the issue is discussed in [Aristotle], *Problems* 25.8; but there the explanation is in terms of spaces between the ashes.

At *Physics* 4.10 218a33ff. Aristotle rejects a number of definitions of time, including its identification with the rotation of the heavenly sphere. He does not himself name the proponents of the various views; Simplicius cites Eudemus (fr. 82aW), Theophrastus (fr. 150 FHS&G) and Alexander for the identification of this view as Plato's, no doubt on the basis of *Timaeus* 39cd.²⁴ In fr. 82b (below) it appears that Simplicius is quoting Eudemus via Alexander rather than directly, and it therefore seems likely that Alexander is Simplicius' source for Eudemus and Theophrastus' views in fr. 82a as well. This is indeed what one might

²² Simpl. *In phys.* 468.4 = Eud. fr. 64W. Cf. Wehrli 1968, 656; 1969, 100–1.

²³ Arist. *Meteor.* 2.3 359b4–7, 4.11 389b2; cf. Theophr. *CP* 6.3.2, Galen at Theophr. fr. 426 FHS&G, and Sharples 1995, 199–200.

²⁴ Cf. Cavagnaro-Stuijt (1995, 51–3), who defends the attribution of this view to Plato. She notes (53 n.14) that Simplicius himself protests (*In phys.* 703.1ff.) that the number or measure of the movement features in Plato's account too. Simplicius does so, however, in the context of replying to Alexander's second criticism of Plato ([B] in Simplicius, *In phys.* 702.24ff., cited below), that Plato calls time not the number of motion but a motion according to number, not in replying to the criticism that Alexander reports from Eudemus ([A] below, developed by Alexander in [D]).

in any case expect with a report in this form, even though Simplicius clearly makes direct use of Eudemus' works, and apparently Theophrastus' too, elsewhere.²⁵

Simplicius further reports that Eudemus argued that Plato's definition of time was inconsistent with the existence of motion before the ordering of the cosmos in the *Timaeus* (interpreted literally):

[A] Alexander, striving to show that the opinion which states that time is the movement of the heaven is Plato's, calls as his first witness Eudemus, who says "Plato too followed this opinion, quite absurdly. For he says that, before the heaven came to be, there was disorderly motion. His left hand doesn't know what his right hand is doing, if indeed all motion is in time." [B] Next he [Alexander] does not accept the view of those who say that Plato agrees with Aristotle in saying that time is the number of motion when he calls it "an eternal image proceeding according to number" (*Tim.* 37d). "For [Plato] does not call time a number of motion," he [Alexander] says, "but a motion according to number, that is, [an] orderly [motion]."

Well, that is what Alexander says. But I must indicate, [C] first what made Eudemus suppose that Plato says that the rotation of the heaven is time, and then [D] that Plato is not liable to the absurdity that Alexander inferred, [namely] that there is a time before time.²⁶ "For if all motion is in time," he [Alexander] says, "it is clear that the unharmonious and disorderly motion is in time, too. If then this motion existed before the heaven came to be, it is clear that there was also time before the rotation of the heaven. So if this [the rotation of the heaven] is time, there would be time before time." (Eud. fr. 82bW = Simpl. *In phys.* 702.24ff.)

Eudemus' point in [A], elaborated by Alexander in [D], is an addition to Aristotle's discussion at this point in the *Physics*, where there is no specific mention of Plato at all.²⁷

²⁵ This whole issue is discussed in detail in Han Baltussen's paper in this volume. It is true that we cannot exclude Simplicius' having made direct use of Eudemus and Theophrastus in fr. 82a. Sider (1981, 26) rightly argues against Diels (1879, 112–13) that fr. 82a does not prove that Simplicius *generally* knew Theophrastus only through Alexander; but it may still be the case that in this instance Simplicius is relying on Alexander for information about his predecessors.

²⁶ Eudemus in [A] simply asserts that (i) the existence of motion before time and (ii) the claim that all motion is in time are incompatible; Alexander in [D] makes the absurdity explicit by pointing out that (i) and (ii) together imply the existence of time before time.

²⁷ Vlastos (1965a, 386–8; 1965b, 409–14) argues that Aristotle did not himself bring an objection like [A] against Plato because he shared Plato's assumption that time is connected with orderly motion.

The presence of such information about earlier thinkers in Eudemus' *Physics* reminds us that there is a question concerning the sense to be given to the term ἰστορία in the titles of others of Eudemus' writings. A similar issue concerning the presence and extent of references to earlier thinkers arises in connection with Theophrastus' *Physics* too, and there is another Theophrastean title, Φυσικὴ ἰστορία (Theophrastus 137 no. 5 FHS&G) the relation of which to Theophrastus' *Physics* is at least debatable.²⁸

Aristotle goes on to illustrate the dependence of time on change by the story of the Sleepers in Sardinia, or more precisely of "those who are said in the story to sleep in Sardinia in the presence of the heroes" (4.11 218b24). For the story is, as Ross points out, a conflation of the types familiar to us respectively as the stories of Rip van Winkle and of King Arthur or Friedrich Barbarossa; the person who sleeps for a long period without realising time has passed, and the leader who sleeps but will awake in his country's hour of need. As Simplicius explains more fully than Aristotle himself, the Sleepers themselves were dead heroes whose bodies looked as if they were only asleep, and in their presence people slept for longer periods than normal in search of divination from dreams.²⁹ Only the latter point, in fact, is relevant to Aristotle's argument. Eudemus, according to Simplicius (Eud. fr. 84W) *omitted*³⁰ the Sardinian story and instead cited people who, after partying too well in a cave during a festival, slept right through the next day and into the middle of the following night, when one of them woke up but saw the stars and went back to sleep again; the next day, when they all woke up, they celebrated the next part of the festival a day late, thinking only one night had passed.³¹

At 4.12 220b12 Aristotle mentions in passing that the same time can be repeated, meaning by this no more than that there can be successive

²⁸ See the discussion in Sharples (1998) 4–5, 8–9, and the references there.

²⁹ Simpl. *In phys.* 707.28ff.; Ross 1936, 597. Philoponus, *In phys.* 715.16–19, says that people went to the heroes to have their sickness cured, and slept for five days. For a full discussion of the story cf. Rohde (1890) 157–63; Cavagnaro-Stuijt (1995) 292–300.

³⁰ παρείς. Ross says Eudemus "confirmed" Aristotle's example by adding the Athenian one; but Simplicius' account rather suggests that Eudemus omitted the Sardinian story altogether.

³¹ Wehrli (1969, 105) here refers to "the anecdotal digression of the Hellenistic diatribe"; see above, n. 18. Cf. also Wehrli (1968) 656, comparing Eud. fr. 90.

years. Eudemos (fr. 88W) makes this the occasion for an excursus on the Pythagorean doctrine of temporal recurrence — “I with this staff shall be telling stories like this to you sitting there like that” — and points out that, if everything else is the same, the time will be too (cf. Sorabji 1983, 183).

At 6.1 231b10 Aristotle argues that if lines were composed of indivisible minima, they could be divided into parts which themselves have no parts; but that nothing continuous could be so divided has already been shown, at 231a26–b6. Eudemos, according to Alexander cited by Simplicius, added an extra argument (fr. 100W; cf. Wehrli 1968, 656); if lines *were* so composed, and one were larger than another by one point only, then either not every line could be bisected, or a point would have to be divided into two.

3. Systematisation

We also find Eudemos apparently making Aristotle's exposition more systematic.³² True, in one case at least he and Theophrastus are cited together in this regard; Simplicius explains (Theophr. fr. 147 FHS&G = Eud. fr. 79bW) that they both treated the requirement that place be unmoved as axiomatic, while Aristotle first speaks of the place of a thing as the innermost boundary of what surrounds it, and only later in his exposition introduces the further requirement that it be the innermost *unmoved* boundary. The difference is, as Simplicius himself makes clear, purely one of expository technique; but, as indicated at the start of this paper, such points too may be significant.³³

As Algra notes,³⁴ Eudemos in fr. 80 makes explicit the role, implicit in Aristotle, of the heavens as the unmoved container which provides a reference point for place in general.³⁵ True, even the heavens are

³² Sometimes, indeed, it is a matter of clarity in exposition alone; thus Simpl. *In phys.* 955.27 = Eud. fr. 102W comments that, whereas Aristotle in *Phys.* 6.3 234a1–2 used ἐπὶ τὰδε of the relation of the now both to the future and to the past, Eudemos used ἐπὶ τὰδε for one and ἐπὶκείνῃ for the other.

³³ Wehrli (1969, 104) speaks of a “tightening up” of Aristotle's exposition here. Cf. Algra (1995, 252–3), who speaks of possible increased awareness of the importance of place being immobile.

³⁴ Algra 1992, 145–6, 163; id. 1995, 253; Sorabji 1998, 207–8. What Aristotle himself says (4.4 212a21ff.) is that the heavens and the centre of the world provide the primary references for “above” and “below”.

³⁵ One might perhaps compare the way in which Alexander in his *On Time* is ap-

moving in the sense that they are rotating; this may have been the point of the second of a series of tersely reported difficulties for the Aristotelian doctrine of place raised by Theophrastus,³⁶ and Eudemus in fr. 80 provides answers both to this difficulty and to another of Theophrastus' problems, that the heaven will not itself be in place, for there is nothing outside it.

To the *first* difficulty, that concerning movement, Eudemus responds that it is only the parts of the heaven that move, not the heaven as a whole. It is the second problem, that of the place of the heaven itself, that is more interesting for our present purpose. Theophrastus in fact raises it in two forms, first for the outermost sphere of the fixed stars, and then for all the heavenly spheres taken together. Simplicius, at least, suggests that Eudemus considers only the latter version.

Eudemus' first answer to this second problem is that, since the parts of the heaven are in place, therefore the whole is too. This is taken by Algra (1995) 257 as referring to the spheres other than the outermost one of the fixed stars, so that ἄστρα will refer to the planets as opposed to the fixed stars. If the argument is taken in this way the heaven must certainly be understood as all the heavenly spheres taken together, but there is still the problem what is the place of the outermost sphere.³⁷ On the other hand, the parallel text in Aristotle (*Phys.* 4.5 212b13) says that "in the case of a circle one [part] surrounds another," which sounds more like a claim that in *any* circle successive parts of the circumference provide boundaries for each other — though not on all sides, as is noted by Hussey 1983, 120 — than a reference to the specific notion of

parently more ready than Aristotle himself to see the motion of the heavenly sphere as being time, rather than just being the most obvious and accessible indicator of it (Arist. *Phys.* 4.14 223b18–23; cf. Sharples 1982, 69).

³⁶ Theophr. fr. 146 FHS&G. Theophrastus has, on the basis of 149 FHS&G, been seen as abandoning Aristotle's theory of place in favour of a new approach. The history of scholarly debate on this topic is well summarised by Algra (1995, 242–3). Cf. especially Steinmetz 1964, 156–7; Sorabji 1988a, 186–201. Algra's own conclusion (247–8) is that Theophrastus' discussion was essentially tentative. He suggests (254–5) that Eudemus too may have had doubts about the ontological status of place — certainly noting that we cannot apprehend it directly (fr. 73W) — but that there is no indication that this led Eudemus actually to abandon Aristotle's theory.

³⁷ The argument that the outermost sphere has a place because it is "surrounded", on its *inner* side, by what is inside it seems to appear first in Them. *In phys.* 121.2–4, 8–11; it is objected to by Simpl. *In phys.* 590.27–32, 592.22–7, and Philoponus, *In phys.* 565.21–566.7. Cf. Sorabji 1988b, 146.

nested concentric spheres.³⁸ Moreover, Eudemos' solution to the previous problem, that of the heavenly rotation, involves parts in the sense of sections of the circumference, not in the sense of concentric spheres. If that was his intention in this argument too, then either we must suppose that Simplicius is wrong and Eudemos intended the argument to apply to the outermost sphere only, or else we must suppose that Eudemos himself did not discriminate too sharply between segments of a single sphere and segments of a whole heaven composed of several concentric spheres. In either case, if the reference to segments of a circumference is appropriate at all, the "stars" will presumably include the fixed stars, regarded as parts of the circumference of the sphere in which they are fixed.³⁹

However this may be, the argument is highly dubious, as both Sorabji and Algra point out.⁴⁰ The claim that the whole is *in* that in which the parts are is questionable precisely when the whole *is* that in which the parts are.⁴¹ There is, moreover, a question as to how original Eudemos is being here. Sorabji notes (1988a, 193; 1988b, 144 and 160 n.28) that the point that rotation does not involve movement of the whole is made by Aristotle at *Physics* 4.5 212a31 and *GC* 1.5 320a21. As for the second problem, concerning the place of the heavens, the parallel with Aristotle's own discussion at *Physics* 4.5 212b11ff. has already been remarked.⁴² Eudemos however goes on, as Sorabji and Algra note, to

³⁸ Though, as Algra points out, it is difficult to see why Theophrastus, if he understood the argument this way, should distinguish between its application to the outermost sphere and its application to all the spheres together.

³⁹ Hussey, *loc. cit.*, interprets the parts of the outermost sphere in the context of the rotation problem as including the fixed stars.

⁴⁰ They object (i) that the place will still not be unmoved place and (ii) that there is still nothing outside the outermost sphere. Sorabji 1988a, 194–5; Algra 1995, 257.

⁴¹ Here one might compare the argument at Arist. *Phys.* 4.3 210a25, that a jar of wine cannot be a unity precisely because it can be "in itself" only by one part being in the other. Cf. Sorabji 1988a, 195–6; Cohen 1996, 124–5.

⁴² Cf. Sorabji 1988a, 195 n.45. The text of Aristotle as we have it goes on (212b18) to refer to the place of everything in the heaven as being not the heaven but "the extreme of it which is in contact with the body which can move"; in the context, where the sequence of the elements is described, we might expect this "extreme" to be the innermost surface of the heavenly region, but then "the body which can move" would apply to the sublunary elements only, which seems odd. Odd, too, is the apparent omission of fire from the sequence of elements, so that "aether" must be interpreted not as the fifth element but as another name for fire. Hussey (1983, 121) argues that the whole of 212b17–23 is a later and un-Aristotelian addition, noting not only the

give a *second* answer to this problem of the place of the heaven: the whole is “in” the parts.⁴³ This is an application to the specific problem of the place of the universe of one of the senses of “in” distinguished by Aristotle at *Physics* 4.3 210a16–17 (cf. Wehrli 1969, 104), a passage to which, as we shall see, Eudemus devoted attention; the whole is “in” its parts because it cannot exist without them. But in the context of the present problem it invokes, as Algra observes (1995, 257; cf. Sorabji 1988a, 195), an inappropriate, non-physical notion of place.

What may be equally significant from our point of view is that Eudemus’ discussion omits Aristotle’s references in 212a32 and 212b12 to water and to the soul, passes straight from one point about the heavens to the other, and omits Aristotle’s contrast between being in place *per se* and *per accidens*. It seems that, as we might expect, Eudemus is both abbreviating Aristotle’s account (cf. Wehrli 1968, 656) and tidying it up by keeping the focus on the specific topic of the heavens. Whether the points that he omits here were incorporated elsewhere in his discussion, i.e. whether we are dealing with rearrangement rather than abridgement, we do not, I think, know.

Another example of systematisation, but a rather less helpful or successful one, is in a passage corresponding to the start of Aristotle’s *Physics* book 2. Aristotle at *Physics* 2.1 192b8–23 lists different types of natural things, asserts that each has in it a principle of change of one type or another, and, by contrasting natural things and artefacts, arrives at his formal definition of nature. Eudemus (fr. 50) spells out the properties of each of the different types of natural things listed by Aristotle, and concludes that κίνησις is what they all have in common. But, whereas in Aristotle’s discussion growth is explicitly included as a type of κίνησις, in Eudemus’ it seems to be contrasted with it, Eudemus pointing out that not all natural bodies grow, but they do all move, in the sense of locomotion. (True, Eudemus draws distinctions between

odd use of “aether” —as he says, never applied elsewhere by Aristotle either to fire or to the fifth element in stating his own theory, as opposed to reporting the views of others: contrast [Arist.], *De mundo* 2 392a5 — but also the redundant nature of the passage and the fact that within it οὐρανός shifts from being used of the universe as a whole to being used of the heavenly region specifically.

⁴³ Eudemus (fr. 80W) ap. Simplicius. *In phys.* 595.14–15; Themistius. *In phys.* 120.2–3. Sorabji 1988a, 195 n. 45; id. 1988b, 161 n. 35; Algra 1995, 256. This claim should be distinguished from that discussed above, that the whole is in that *in which the parts are*.

different types of locomotion, rather than explicitly stressing it as the common feature; and Simplicius does not himself take up the limitation to locomotion in what follows.) Wehrli (1969, 88, 96–7) regards Eudemus' formulation in this passage as “imprecise” and as a misunderstanding. Aristotle goes on to indicate the difference between a natural thing and an artefact by Antiphon's example of the bed which, if it were buried and sprouted, would produce a tree, not another bed; Eudemus makes a point more directly connected with motion in the narrow sense, with the example of a *flying* bedstead. A bed, he argues, does not fall downwards *qua* bed; for if it had wings, it would not fall downwards, but would still (presumably) be a bed.

At 4.3 210b22 Aristotle answers Zeno's paradox that place will itself be in a place, by saying that there are other ways of being in something than being in it as in a place, for example that in which health is in a body. Eudemus (fr. 78) repeats this, but goes on, as Aristotle does not do *here*, to apply the point to the Aristotelian definition of place itself; the limit of a body is “somewhere” in relation to the body itself. (I take it that “limit of a body” and “innermost boundary of what contains” can here be regarded as approximately equivalent.) The suggestion comes, as Wehrli (1969, 104) points out,⁴⁴ from a later passage in Aristotle's discussion, 4.5 212b28.

As Han Baltussen remarks to me, Wehrli, on p. 88, cites fr. 78 — and *only* fr. 78 — as an example to support his claim that, on the basis of the whole work occupying only five books and Eudemus' having expanded on Aristotle's treatment at some points, “Eudemus must have omitted some sections of the original, probably those which were opposed to his systematising tendency.” It is not perhaps immediately clear whether Wehrli means that Eudemus made omissions on doctrinal grounds, or just for the sake of order and clarity. And, even though fr. 78 shows that Eudemus “systematised” by bringing together material from different points in Aristotle's discussion, and even though he must, if his five books were shorter in total than seven of Aristotle's, have omitted some material, we cannot tell which specific passages he omitted; just *because* he rearranged his Aristotelian material, nothing is proved by the absence of a point from a quotation by Simplicius in the place where we might from comparison with Aristotle expect it to be.

⁴⁴ Fr. 78 is also noted by Algra (1995, 249 [where a printing error has caused the reference to be to fr. “88”] and 256–57).

The topic of different ways of being “in” something had already been raised by Aristotle at 4.3 210a14–24; among the senses listed there are that in which “health is in hot and cold and, in general, the form in the matter”. Wehrli (1969, 105; cf. Algra 1995, 249) notes that Eudemus (fr. 77) explicitly asked whether the sense of “in” is the same in these two cases, and thus prompted discussion in the commentators whether health is here regarded as form or accident. The argument that *form* is not in matter in the way in which a thing is in a substrate is, it may be remarked, one that occurs repeatedly in the writings attributed to Alexander of Aphrodisias, especially in connection with soul as form.⁴⁵ Eudemus in fr. 77 refers to both *πάθη* and *ἕξεις*, both “affections” and “dispositions”; Wehrli notes that later, at 4.3 210b25, Aristotle refers to health being in what is hot as a *ἕξις* and heat being in a body as a *πάθος*, while in 210a20 itself he refers only to the single case of health being in what is hot and cold. Once again, Eudemus is precise and systematic where Aristotle is less so, and once again he achieves this by drawing on a passage of Aristotle other than the one with which he is immediately concerned.

In fr. 87, on the sense in which the “now” is the same and the sense in which it is different, Eudemus seems both to compress what Aristotle says at *Physics* 4.11 219b12 and also to present it in a tidier form, introducing the comparison between the “now” and the travelling point sooner than Aristotle himself does.⁴⁶ Simplicius remarks that Eudemus in fr. 99 may have understood that Aristotle’s argument at *Physics* 6.1 231b6 does not show that points cannot be successive, but only that points cannot by being successive make up a line:

Eudemus employed the argument as follows: “If,” he says, “things that are without parts are in succession, there must certainly be something between that is not of the same sort, so that it will not be a point, but a line or an empty space which is between points in a length. So the line will not be made up of points, for the points in succession are not *in* it. But if [there is] an empty space, then in continuous things there will be more of empty space than of the constituents, that is of the points that are said to be in succession, or else there will be no magnitude at all. For just as two points in contact do not create any length, so neither do a point and an empty space.” I suspect it may be that Eudemus un-

⁴⁵ Alexander (?), *Quaestiones* 1.8, 1.17, 1.26; *Mantissa* 119–20. Cf. Sharples 1990, 110; Ellis 1994.

⁴⁶ Wehrli (1969, 105) refers in this connection to Eudemus’ “simplification” or “reduction” (*Vereinfachung*) of Aristotle’s discussion.

derstood correctly what Aristotle said, that he is not refuting points or nows being in succession simply, but their being in succession in such a way as to constitute length or time. (Simpl. *In phys.* 928.28ff. = Eud. fr. 99W)

The passage that Simplicius quotes from Eudemus hardly shows this, however, for the first sentence seems to make a *general* claim that points cannot be successive but must be separated by either line-segments or empty space. The context might have made it clear that the reference was specific in the way that Simplicius suggests. Eudemus' contrast between line-segments and empty space as separating also seems odd, for from a *geometrical*, as opposed to physical, point of view they come to the same thing. The reference to empty space is an addition to what we find in Aristotle himself, as Wehrli (1968, 656; 1969, 108) notes.

4. Objections not Raised in the Aristotelian Text

We also find Eudemus mentioning, and replying to, objections not mentioned by Aristotle himself. At *Physics* 3.3 202a13–14 Aristotle argues that change is in the thing affected, not in the agent. Eudemus (fr. 61W) states the objection that sensation seems to be in the one sensing rather than in the thing sensed, and responds by saying that in this case it is indeed the one sensing who is affected (πάσχειν — a way of putting it that Aristotle would not be too happy about, without qualification, as *De anima* 2.5 417b2ff. shows) and that we should not be misled by the verbal expression (λέξις), i.e. the fact that “sees” and “hears”, ὁρᾷ and ἀκούει, are active verb forms.⁴⁷ Wehrli notes that Aristotle at 3.3 202a13 refers to the general question of the location of change as an ἀπορούμενον, and suggests that Eudemus' remarks reflect the same school-discussion.⁴⁸

At *Physics* 6.4 234b21ff. Aristotle argues that change is divisible both in respect of the time taken and in respect of the parts of the moving thing, which is itself divisible. Simplicius cites Eudemus (fr. 103W) as raising the problem that, if there are an infinite number of parts in the moving thing, the whole movement will be infinite, and as saying that

⁴⁷ For interest in the limitations of language Wehrli (1969, 100) compares Eud. fr. 29.

⁴⁸ Wehrli loc. cit.; cf. Ross (1936, 540 ad loc.), noting that ἀπορούμενον does not refer back to any specific passage, but to a problem regarded as familiar.

this can be solved more easily for growth and alteration than for locomotion, which “needs to be considered further.” Simplicius does not give Eudemus’ solution in the case of locomotion; but an obvious solution seems to be indicated by the words with which Eudemus starts his statement of the problem, pointing out that the parts do not exist in actuality. Presumably, if they do not exist in actuality, they do not undergo locomotion in actuality, either.

5. Conclusion

The picture of Eudemus’ *Physics* that has emerged from consideration of this selection of passages is not radically different from the general scholarly consensus sketched at the outset. Eudemus follows Aristotle quite closely. Sometimes his exposition is more compressed than Aristotle’s discussion, sometimes he expands it; often he will draw upon his knowledge of other parts of Aristotle’s *Physics* or of other Aristotelian doctrines, and often he will seem to be striving after a more systematic exposition. What I hope this paper may have done is, by consideration of particular passages and arguments, and by setting passages from Eudemus against their Aristotelian originals, to fill out that general picture and enable us to assess Eudemus’ methods and contribution — while remaining mindful always that the extent to which we can do this is necessarily limited by the extent of the available evidence, generous though it may be by comparison with that for many of the lost works of antiquity.

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Wehrli's Edition of Eudemus of Rhodes: The Physical Fragments from Simplicius' Commentary *On Aristotle's Physics**

Han Baltussen

1. Introduction

My aim in the present paper is to give a critical assessment of the (still standard) edition of Eudemus' fragments by Wehrli¹ and, in the process, present some additional material relevant for Eudemus' *Physics*. As to the first aspect, this emphasis on the editorial merits or dismerits of Wehrli's volume slowly grew out of the use of the edition, and aims at presenting clear evidence that the edition —despite its good

* This essay grew out of a project concerned with the sources for Theophrastus' *Physics*. While working on an analysis of Simplicius' quotation-habits from earlier 'commentators' on Aristotle's *Physics* I came to realise (especially after a conversation with István Bodnár in Vandoeuvres, March 1996) that the amount and nature of the material on Eudemus in Simplicius constituted a valuable parallel. I am grateful to Bob Sharples and David Sider for comments on an earlier version, and to István Bodnár, whose comments on the penultimate draft were instrumental in obtaining the right balance and focus.

¹ *Die Schule des Aristoteles*, vol. VIII (first ed. 1955, the second in 1969 with some additions, one of which was already mentioned in the appendix "Addenda" to Wehrli [1959] p. 199).

qualities—no longer lives up to current standards.² The second point serves to substantiate the critical judgment and the need for a new edition. I shall add some basic and preliminary thoughts on a new edition of the fragments, while arguing that we will learn more about fragments if we look seriously at the source author's methods.³

The importance of Simplicius for recovering the doctrines or words of many ancient philosophers is well known,⁴ but also many later thinkers have survived through references or titles found in the commentaries of Simplicius.⁵ In the case of Eudemus of Rhodes his importance for our knowledge of the fragmentary work of the Peripatetic is immediately clear from Wehrli's edition of the fragments, since the majority of fragments⁶ relevant to physics come from Simplicius' *Commentary on Aristotle's Physics* or his *On Aristotle's On the Heavens*.⁷

After commenting on the edition (§2), I shall briefly consider the content and nature of Eudemus' *physika* (§3). I then list and discuss an additional twelve named references to Eudemus in Simplicius' commentary on Aristotle's *Physics* which Wehrli did not print in his edition, although he refers to some of them in unexpected places (§4).⁸ I end with some provisional conclusions (§5) and some useful material for the future editor, a select bibliography on Eudemus, a list of reviews

² It is part of work in progress, which aims at analysing Simplicius' working method and quotation habits (see below n. 34), and in the long run to further our understanding of the nature of Simplicius' commentaries. One way of interpreting Simplicius' commentaries has been offered by Hadot, followed by Hoffmann, p. 74 with n. 123.

³ At present I have no intention to prepare such an edition myself. I am mainly interested in Simplicius' scholarly methodology and how he incorporates and uses his sources. A more intrinsic reason for postponing a new edition is that Leonardo Tarán is preparing a new edition of Simplicius' commentary on Aristotle's *Physics*.

⁴ Parmenides, Empedocles and Anaxagoras are the best examples of Presocratics whose *ipsissima verba* we get mostly from the Neoplatonic commentator (see O'Brien, Sider, Perry, Hadot [ed.], Tarán).

⁵ E.g., he quotes from Alexander of Aphrodisias' (lost) commentary on Aristotle's *Physics*, from Porphyry's (lost) commentary (bk. 1–4) and *synopsis* (bk. 5–8) of Aristotle's *Physics*, and from Themistius' paraphrase of Aristotle's *Physics*. For a more complete list of authors in Simplicius see Tarán, p. 247 and CAG Index.

⁶ 102, in Wehrli nos. 31–123 with subdivisions into a, b etc.

⁷ Fr. 49 is from Plutarch, fr. 89 is from Diogenes Laertius.

⁸ I have tried to trace the references I am about to discuss in the index in vol. X, and in the commentary of vol. VIII, both by reading it and by searching electronically a scan of Wehrli's Introduction (the latter was made available to me by Mr. J. Rustenburg, for which I am very grateful).

of *Die Schule des Aristoteles* vol. VIII [Appendix 1], and of textual matters [Appendix 2].

2. Wehrli's Edition

Although vol. VIII of *Die Schule des Aristoteles* (1955) is an improvement on the earlier edition by Spengel, it has not been regarded as the most successful volume of the series, since it has some serious flaws. One which has been mentioned especially is "the handling of the fragments from Simplicius."⁹ Reviewers have in addition pointed to omissions, to the errors in translation and textual matters, the absence of indices,¹⁰ and the lack of clarification of several editorial matters (e.g., the mention of the *Eudemian Ethics* by title only).¹¹ The second edition (1969) did not make up for the criticisms in some of the reviews.¹²

It is certainly not my intention to judge harshly Wehrli's achievement, since most critics also agree (as do I) upon the importance of the

⁹ De Lacy p. 270.

¹⁰ Among the reviews of the first edition (approx. twenty published between 1956 and 1960; see Appendix 1) there is as much agreement on the merits of Wehrli's edition of material from an uncharted period of Peripatetic philosophy as there is on its defects. I give some examples for both viewpoints: "comme ces aînés, ce huitième fascicule constitue un excellent instrument de travail" (Morau [1956] p. 400); "Es bedarf heute kaum der Worte mehr, um diese Sammlung zu rühmen die sich schon jetzt bei allen Aristotelesforschern als ein unentbehrliches Arbeitsinstrument eingebürgert hat" (Gigon p. 71); "Nichts könnte willkommener sein als das VIII. Heft dieser vorzüglichen Sammlung . . ." adding only two points of criticism (Drossaart-Lulofs p. 266–8); "A cause for complaint is the absence of the numbers of Spengel's fragments alongside the new fragments of Wehrli, . . ." (Kerferd [1957] p. 33); De Lacy p. 270–1, starts out by saying "As always, Wehrli offers a well-reasoned organization and much informative comment" but then goes on to provide a long list of defects concerning the apparatus, interpretation and demarcation of the texts (I will come back to De Lacy's criticisms below). Note that the second edition of vol. X (in 1969) eventually provided indexes and concordances. Cf. below, nn. 11–12.

¹¹ Fr. 151 (title only). I am not suggesting Wehrli should have printed it, but rather that he should have explained why he did not. Its attribution to Eudemus is now generally rejected, see Sharples (1996) p. 565.

¹² Vol. VIII, 2nd ed. was labelled untrustworthy for not recording sufficiently the new results of research since the 1st. ed. (Kerferd [1970] p. 400). It certainly did not take up all the suggestions made by reviewers (see note 10 and text thereto). All but 4 of the misprints indicated by De Lacy p. 271 n. 2 (I counted twenty-three) were corrected—as is visible on the relevant spots where the text is pasted in; those at Wehrli p. 21.18, 24.8n, 25.22n and 43.24n were not.

project he undertook; in any event, allowance must be made for the intrinsic difficulties in collecting philosophical fragments. But it seems fair to say that the second edition would have gained in accuracy and completeness by taking up the suggestions made in the reviews.¹³ Additional grumblings are that (i) frequent references of the kind “cf. fr. 31–123” in the commentary, i.e. to (the introduction of?) the whole physics section, are extremely unhelpful (why not pages?); (ii) that the textual references of the fr. should indicate the passage printed completely (beginning and ending by page and line); (iii) that the index (or rather the indices) should be attached to the volume in question, and (iv) that it should be possible—but this is a point which holds for all fragment collections in general—to create a more sophisticated terminology for differentiating between context and paraphrase/ quotation/ reminiscence (see below §5). Often the quotation marks in the source edition (in this case Simplicius in CAG, Diels) are too quickly taken as a sign for literal quotation when it is anything but certain that this is the case.

All these points leave one with the impression that the serious attempt at editing the fragments falls short of a satisfactory result for a number of reasons, esp. in the area of editorial policy and clarity.

3. Eudemus’ φυσικά: Content and Nature of the Work

The fragments on physics show Eudemus as an exegete and interpreter of Aristotle’s *Physics*, whose main concern is to clarify and systematize. It is generally assumed that these were lecture notes used by Eudemus to teach Aristotle’s physics in his own ‘school’ in Rhodes; this may also explain why Eudemus’ comments seem to possess a dogmatic and systematizing tendency (*pace* Wehrli, n. 17). He seems to have followed the order of Aristotle’s treatise closely (see below), and he is said to have passed over book 7.¹⁴ From the remarks in Simplicius we

¹³ See Appendix 1 below. The volume on Strato (vol. V) was dismissed as “incomplete, inaccurate and badly arranged” (Gottschalk [1965] p. 97). This seems unnecessarily harsh (even if partly correct).

¹⁴ *In Phys.* 1036.14f. τοῦτο [i.e., bk. 7] παρελθὼν ὥς περιττὸν ἐπὶ τὰ ἐν τῷ τελευταίῳ βιβλίῳ μετῆλθεν. The phrase παρελθὼν ὥς περιττὸν is ambiguous and need not represent Eudemus’ own view on the matter: it can also be taken as Simplicius’ interpretation of the absence of any remarks on book 7 in Eudemus’ comments (see below on T3). Ross (3, 18) accepts Simplicius’ comment without any compunction and next argues that book 7 became inserted at its present position later (perhaps by

can get a fairly good idea in what order and in how many books he wrote down his clarifications. If we collect the references to books we get the following list of correspondences¹⁵:

bk.	Simpl. <i>In Phys.</i>	fr. in Wehrli
1	I.1, 10.3 ἀρχόμενος τῶν φυσικῶν	32 (cf. I.2, 48.6 = fr. 34)
	I.3, 133.21 ἐν τῷ πρώτῳ τῶν φυσικῶν	44 (cf. II.1, 263.20 = fr. 50)
2	III.1, 411.15 ἐν τῷ δευτέρῳ τῶν φυσικῶν	59 (cf. III.4, 459.25 = fr. 62)
3	IV.1, 533.14 ἐν τρίτῳ τῶν φυσικῶν	75
	(cf. IV.7, 662.25 = fr. 81; IV.11, 710.33 = fr. 85; IV.11, 717.6 = fr. 86; IV.11, 723.36 = fr. 87)	
	IV.12, 732.24 ἐκ τοῦ τρίτου τῶν φυσικῶν	88
	(V.2, 860.9 ἐν τοῖς ἑαυτοῦ φυσικοῖς)	93a
4	VI.2, 942.18 ἐν τῷ τετάρτῳ τῶν φυσικῶν	101 (cf. VI.5, 989.26–30 = fr. 104; VI.6, 991.29 = fr. 105)

5? VIII? (Schöbe 10, Wehrli 88, Sider 24)

In outline, then, his work seems to have consisted of four (or perhaps five) books, in which he discussed subjects dealt with by Aristotle in books 1–6 and 8.¹⁶ It is clear that he needed less books than Aristotle

the time of Hermippus, ca. 200 B.C.). On the problems concerning the history of the book division of the *Physics* and the position of book 7, see Mansion p. 55 n. 5; Ross, p. 1 ff. esp. p. 8–19; Moraux (1973) p. 115–16, and especially Wardy.

¹⁵ A similar but shorter list already in Spengel p. viii (who seems to be depending on Brandis, see p. vii). Here I build on and expand on Schöbe p. 9–10; Sider p. 24. Wehrli does not attempt to reconstruct the structure of Eudemus' work in detail (see the commentary, p. 87–8: "Zitate aus E. mit Angabe des Buches gehen nicht über das vierte Buch hinaus (das letzte, fr. 10, bezieht sich auf Aristoteles Physik VI 6), die Zahl der folgenden Fragmente erlaubt aber, noch ein fünftes Buch anzunehmen"). Martini's list (col. 900.14–19) of correspondences is flawed probably because he used the Aldine edition (as Bob Sharples has kindly pointed out to me). Spengel claims that there are three testimonia for the assumption that III and VI were treated together, but unfortunately he fails to list these.

¹⁶ I have not used Greek letters to number the books (as, e.g., does Sider p. 24 for Aristotle's books; cf. Martini col. 900), although it would be justifiable from Simplicius' statement that "those from the Peripatos" had the habit of doing so (*In Phys.* 923.3–7, cf. 1037.4–5). The numerals Simplicius says they used are Α Β Γ Δ Ε Ζ Η Θ (for 1–8) which was the common system to label a sequence/series (e.g., books of the *Iliad*) as opposed to calculation when they would use digamma (Ϝ) for the number 6, and zeta

did, and from this it has been assumed that Eudemus' *Physics* was an abbreviated and reworked version of Aristotle's.¹⁷ What form the work must have had is still to be considered. But first we may go a little further in examining the nature of his exegesis as reported by Simplicius.

Possibly one of the reasons why Simplicius (and perhaps Alexander and others before him) found Eudemus' comments useful is that his approach towards Aristotle's text may have been helpful in understanding it.¹⁸ In all his remarks an attempt to further clarify Aristotle's words is present: he is drawing out implicit or tacit assumptions and reformulating them as explicit stages in his reasoning. Simplicius' qualifying remarks before quotations from Eudemus seem to support such an interpretation:

- (a) Eudemus is said to follow Aristotle closely in the main topics of his treatise:

In Phys. 924.18 ὁ Εὐδήμος τὰ τοῦ Ἀριστοτέλους παραξέων . . .

(= fr. 98W)

In Phys. 1036.13 σχεδὸν τοῖς ὅλης τῆς πραγματείας κεφαλαίοις παρακολουθήσας . . . (= fr. 109W)

- (b) he proceeds by shortening paraphrase:

In Phys. 1206.27 παραφράζων σχεδὸν καὶ αὐτὸς τὰ Ἀριστοτέλους, τίθησι καὶ ταῦτα τὰ τμήματα συντόμως λέγων (= fr. 113W; cf. 74.18 = fr. 35W)

- (c) without necessarily losing in clarity:

In De cael. 497.24 συντόμως καὶ σαφῶς ὁ Εὐδήμος ἱστόρησεν
(= fr. 149W)

- (d) he may also approach a problem in an elaborate way:

In Phys. 48.6–7 ζητεῖ μὲν φιλοκάλως τὸ πρόβλημα (= fr. 34W)

- (e) and be praised for his clarity:

In Phys. 48.26–7 ταύτην τὴν τοῦ Εὐδήμου λέξιν σαφῶς ἐκτιθεμένην

for 7 etc. (not noticed by Konstan p. 15n.), on Greek numerical systems see Tod [I owe this reference to Paul Keyser].

¹⁷ "Aus den Fragmenten ergibt sich das Bild einer verkürzenden Bearbeitung der aristotelischen Physik, welche deren Anordnung und Problemstellung beibehält und nur in Einzelheiten der Behandlung selbständig ist" (Wehrli p. 87). "E.s Schrift diente vermutlich als Vorlesungsmanuskript; als Überarbeitung von Aristoteles Pragmatien zeigt sie, daß diese nicht als geistiges Eigentum des Urhebers, sondern als Darstellung der peripatetischen Schuldoktrin galt." Wehrli's claim (p. 87f. with reference to Schöbe p. 9) that a fifth book must be assumed because of the number of references to Eudemus after *In Phys.* VI is reasonable.

¹⁸ Cf. Wehrli p. 88: "Die . . . erhöhte Verständlichkeit machte E.s Physik zum bequemen Ausgangspunkt der Aristoteleskommentatoren" and n. 19.

τὴν τῷ προβλήματι προσήκουσαν ἀπορίαν (= fr. 34W)

In Phys. 83.28–9 μετ' ὀλίγον παραθήσομαι τὴν τοῦ Εὐδήμου λέξιν ἐναργῶς τὸν σκοπὸν τοῦ λόγου δηλοῦσαν (= fr. 36W)

In Phys. 433.13 ὅ γε Εὐδημος σαφέστερον ἐξέθετο τὴν Ἀριστοτέλους ἀπόδειξιν (not in W see T12 below);

(f) or he has set out a problem in an unfailing fashion:

In Phys. 1355.28 ἀσφαλῶς ὁ Εὐδημος τὸ πρόβλημα ἐκτιθέμενος (= fr. 122bW)

Even when we make allowance for the subjective nature of some of these assessments, Simplicius' elaborate use of Eudemus is in itself an argument in favour of the latter's value. Eudemus' comments apparently make him a good guide for later students of Aristotle's *Physics*. But the nature of these notes also seems to indicate that the 'title' τὰ φυσικά, when used by Simplicius in connection with Eudemus, refers to a work of a different character than Aristotle's *Physics*. From Simplicius' descriptions one is inclined to think of these lecture-notes as a shorter version of Aristotle's *Physics* with some evaluative comments added, since they are both shorter in terms of the general line of argument (note κεφαλαίοις 1036.13 and the number of books), and longer in terms of clarification (φιλοκάλως, σαφῶς ἐκτιθεμένην, ἀσφαλῶς).¹⁹ Scholars seem hesitant to infer that Eudemus seems to have written some sort of 'commentary', but to call it that is not as far-fetched as it may seem, and may largely depend on definition.²⁰ We can at least conclude that he seems quite independent towards the treatise

¹⁹ Wehrli p. 88 also infers that, because of both shorter and longer treatment, "muß E. einzelne Abschnitte übergangen haben," adding that Eudemus skipped "vermutlich solche [Abschnitte], die seiner systematisierenden Tendenz widerstrebten (cf. z.B. zu fr. 78)." Both remarks are tendentious and ill-founded: the first seems to imply carelessness, but Simplicius never tires of pointing out that in Eudemus conciseness and clarity go hand in hand (see passages just quoted in the text); the second accuses Eudemus of 'doctoring' the material, but no detailed argument is offered to support this.

²⁰ Algra p. 248 is an exception, speaking of the work as "something more than a merely exegetical commentary" and calls it a "shortened paraphrase . . . with additions and clarifications." Barnes et al. p. 5 speak of the works by Theophrastus and Eudemus as "interpretations or exegeses of Aristotle, in a loose sense," and add "but there is no reason to believe that they wrote commentaries on his writings" [my italics]; in a footnote (n. 31) they further state that one should distinguish "essays in interpretation from commentaries proper." I note that Moraux (1973) starts his chapter "Die ältesten Kommentatoren" with Andronicus (1st. c. b.c.). On Andronicus see now the extensive analysis with minimalist conclusions by Barnes (1997).

(more so than Theophrastus apparently), creating a reworked version of some of Aristotle's ideas on physics while keeping to the main layout and structure of that work.

The reason I am not happy with the translation *Physics* for Eudemus' τὰ φυσικά is that the features discussed above suggest that we should avoid thinking of a full-blown treatise.²¹ Clearly there is a very thin line between a reworked paraphrase and a shortened version with added remarks or 'notes'. To characterise the work as 'notes on (Aristotle's) physics' might imply that Aristotle's text was considered to be canonical.²² Bob Sharples (in this volume) has shown that there are several possible ways to interpret Eudemus' work as well as the differences between Eudemus' and Theophrastus' approach towards Aristotle's *Physics*. From his remarks it is clear that Eudemus may be trying to reformulate Aristotle's work (in an attempt to clarify the dense prose), whereas Theophrastus is commenting in an aporetic fashion.²³

We have no way of checking what the 'title' of Eudemus' φυσικά was (if there was one), but it is possible that Simplicius labelled it τὰ φυσικά as analogous to other Peripatetic works. It is well known that, despite Aristotle's variable use of the label (Ross, p. 1–2), Simplicius mostly uses φυσικὴ ἀκρόασις for that work.²⁴ It may in addition be pointed out that the common practice of printing ancient 'titles' as modern titles (with an initial capital) is misleading: τὰ φυσικά may, it seems, have several different shades of meaning, all of them sharing the basic idea of (writings on) physical matters. It may seem a trivial point, but all too often a wrong label introduces a number of questionable connotations, which may then lead to questionable assumptions.²⁵

²¹ This and because of the uncertainty of which descriptive labels are actual 'titles' in antiquity are reasons for not printing these with a capital initial.

²² The risk of taking 'notes on' in this way was kindly pointed out to me by Bob Sharples (e-mail May 6, 1997).

²³ In reply to my question whether he thinks the brevity of Theophrastus' *physika* is caused by the aporetic approach Sharples replied (e-mail May 6, 1997): "Or is it . . . that he is writing for/speaking to people who have read Aristotle's text, whereas Eudemus is seeking rather to replace the latter? (The two explanations aren't incompatible, indeed)." The matter needs further study.

²⁴ Cf. CAG index s.v. 'Theophrastos' (p. 1447), 'Locī Aristotelici' (p. 1459f.).

²⁵ There is the further consideration that references to titles tend to become 'more secure' as time progresses, even when it is obvious, as for instance in the case of περὶ φύσεως with reference to the Presocratics, that they will not have used fixed labels as titles.

The issue of the completeness of Simplicius' copy of Eudemus' work has been raised by scholars, because some remarks in Simplicius suggest that he had a less complete copy than Alexander.²⁶ The amount and detail of Simplicius' information (esp. the numerous references to the individual books) certainly make it probable that he had a copy of Eudemus' work. But the situation is complex, since Simplicius is referring to and quoting from Eudemus' comments alongside those of, e.g., Alexander, Porphyry and Themistius, and Alexander also quotes from Eudemus.²⁷ Thus Simplicius several times not only reports Eudemus *via* Alexander (e.g., 930.34 = fr. 100; 115.11 = fr. 43),²⁸ but he also states that he was unable to find the words which Alexander quotes from Eudemus (e.g., *In Phys.* 133.26 = fr. 44 ὥς 'Αλέξανδρός φησιν· ἐγὼ γὰρ οὐχ εὔρον ἐν τῷ Εὐδημείῳ τὴν λέξιν ταύτην). Three suggestions have been made so far to explain this, either by assuming a less complete version than Alexander's (Schöbe p. 72) or by assuming that Alexander's paraphrase obscured the Eudemian material (Wehrli p. 95), or by taking it as Simplicius criticizing Alexander for extreme brevity (Sider p. 26: "a not very oblique criticism of Alexander's scholarship").

I would prefer the first as the most probable one (to be discussed in a moment), while I find the second unlikely, mainly because it is not very different from the third, except for the fact that it makes Simplicius unaware of Alexander's supposed obscurity. The third option (Sider's) seems rather forced. The passages discussed by Sider will not all fit into this explanation: even if he is probably right about fr. 37a²⁹—i.e. that Alexander is criticized for "his condensation of Eudemus"—, this does not mean that the phrase οὐχ εὔρον ἐν τῷ Εὐδημείῳ τὴν λέξιν ταύτην

²⁶ See Sider p. 25f. whom I partly paraphrase here.

²⁷ See, e.g., context of frs. 32–3 (*In Phys.* 42.5–26), and of fr. 36 (*In Phys.* 83.10–24). On some aspects of Simplicius' use of quotation see my pilot study Baltussen (2001a).

²⁸ Fr. 43 is puzzling: τοῦτο δὲ εἰ μὲν ἀλλαχοῦ πού γεγραφεν οὕτως σαφῶς Εὐδημος, οὐκ ἔχω λέγειν· ἐν δὲ τοῖς φυσικοῖς περὶ Παρμενίδου τάδε γράφει, ἐξ ὧν ἴσως συναγαγεῖν τὸ εἰρημένον δυνατόν. Unless Simplicius is just being hasty or careless in browsing the text here, he seems to indicate either that his version of Eudemus' physics lacks certain passages or that the quote he found in Alexander, not in Eudemus, might be from another work (note μέν . . . δέ).

²⁹ Sider p. 26 quotes *In Phys.* 99.12–18 (part of fr. 37a on Wehrli p. 27), but mistakenly labels it as "fr. 38."

(fr. 44)³⁰ should be taken as criticism of Alexander instead of a locative phrase.³¹

But in view of Simplicius' use of εὑρεῖν I prefer to think that Simplicius' text may have had some gaps (first option). One further testimony in favour of this is fr. 122b (1355.28ff., not mentioned by Sider in this context), where use of the verb in a positive formulation is clearly locative:

τὸν δὲ Εὐδημον ὁ Ἀλέξανδρος τὸ πρῶτως κινεῖν ἐν τῷ μεγίστῳ κύκλῳ φησὶ
λέγειν τῷ διὰ τῶν πόλων· οὗτος γὰρ τάχιστα κινεῖται. ἐγὼ δὲ οὕτως ἡύρον
τὴν γραφὴν ἐν τῷ Εὐδημείῳ κτλ.

Alexander states that Eudemus says that the first mover <is> in the largest circle through the poles; for that moves fastest. *but I found the statement thus in the Eudemian <writing>: [quotation follows]*

There seems to be no reason to read remarks like this in any other way than as evidence that Simplicius' information on Eudemus is forthcoming from both Eudemus and Alexander. It is moreover likely that Simplicius would probably use another verb for Alexander's interpretive failure: in several cases in which he rebukes Alexander for not "understanding" the views he discusses Simplicius uses the verb ἀκούειν (e.g., *In Phys.* 644.25). Consequently we cannot exclude the possibility that Simplicius' copy of Eudemus' work on physics was less complete than Alexander's.³²

³⁰ 133.21–5: καὶ ὁ Εὐδημος δὲ τῷ Ἀριστοτέλει πάντα κατακολουθῶν τοῦ ὅπερ ὄντος οὐκ ἤκουσεν ὡς γένους. ἐν γοῦν τῷ πρῶτῳ τῶν Φυσικῶν περὶ Παρμενίδου λέγων ταῦτα γέγραπεν (ὡς Ἀλέξανδρός φησιν· ἐγὼ γὰρ οὐχ εὗρον ἐν τῷ Εὐδημείῳ τὴν λέξιν ταύτην).

³¹ If Sider means that the subtext is "this is not what Eudemus wrote," I simply disagree: How could Simplicius reproach Alexander's bad scholarship unless he had Eudemus' text to check his version?

³² Even if—as both Sharples (cf. his paper in this volume, n. 26, on fr. 82a) and Sider in personal communication have pointed out to me—in *this instance* Simplicius is relying on Alexander for information. Since we know from several examples that manuscripts did come in different versions, it is not unlikely to have been the case here (see, e.g., *In Phys.* 167.33ff. where 168.2 τὰ μὲν εἰς ἐμὲ ἐλθόντα βιβλία τοῦτο τὸ ῥησεῖδιον οὐκ ἔχει shows that Alexander had a more elaborate text than Simplicius, and cf. Alex. *In De sensu* 86.2–3, Simplicius *In Phys.* 440.12–15, where a difference in manuscripts is mentioned). See also Moraux (1985) p. 231f.

4. Additional Material concerning Eudemos

4.1 *Obiter lecta*

In studying the fragments of Eudemos in Simplicius' commentary on Aristotle's *Physics* I came across some passages apparently omitted by Wehrli. Eudemos is mentioned in all of these by name. They are however not all very important.³³ But in collecting fragments (especially of material otherwise not extant) completeness is an aim in itself. I also hope to show that even from the remarks in the immediate context we may glean relevant bits of information for understanding the fragment. Moreover, at least five passages seem to give a quotation from Eudemos. It is admittedly often very difficult to distinguish in prose between paraphrase and 'quotation' (and all possible grades of textual echoes in between). For our purposes it is not essential how we label them, as long as we are aware that ancient standards of accurately reproducing one's sources were different from modern scholarship. I think it is in general safe to follow Simplicius' indicators when (in different ways) he claims he is reproducing the author's words from a written source.³⁴

All the passages not printed by Wehrli were already noted (but not discussed) by Phillip De Lacy in his acute review of *Die Schule des Aristoteles* vol. VIII (1st. ed.) in 1957.³⁵ While pointing to Wehrli's selectivity of references to Eudemos by name he lists the following passages he thought were not included by Wehrli (p. 270 n. 1): *In Phys.* 11.17; 48.26, 28; 63.19; 69.22; 74.29; 118.6, 9, 19; 120.6; 121.9 [quote at 13]; 138.29 and 30; 433.13; 717.15; 725.23.³⁶

We may go over the passages in order of occurrence and importance. In each case I give: a provisional number (e.g., T1 for Text 1), the lines

³³ Even De Lacy admits that (*loc. cit.*).

³⁴ We have enough evidence in most cases to assume that he had a text of a great number of authors to hand, but this does not mean that we can simply rely on *verbatim* accuracy. I have discussed some features of his methodology further in Baltussen (2001a). For some judicious remarks on this issue see Wildberg (1987) p. 29–31, van den Hock (1996) p. 227–9.

³⁵ De Lacy p. 270–1. Wehrli did refer to them, albeit in awkward places: fr. 37a referring to 138.31–139.3 (= my T11); apparatus of fr. 43 mentioning 118.10; 118.11; 118.19; 118.14; 120.6; 120.10; 120.11; 121.13 (= my T8–10); and apparatus to fr. 60 referring to 433.14 (= my T12) [I am grateful to István Bodnár for pointing these out to me].

³⁶ Other additions/parallels are mentioned by Gottschalk, see below n. 45.

of the text as printed, and the reference where Eudemus' name occurs; the text (CAG, Diels for T1–7), a translation in some cases; some basic comments on position (in Simpl., and in relation to known fragments) and context. Brief comments deal primarily with philological points, but I shall also raise some methodological issues about editing fragments.

4.2 *Addenda Eudemea*

A. SHORT REFERENCES BY NAME (T1–7)

T1. *In Phys.* 11.16–17 Diels (name at 11.17): Τούτων δὲ ἡμῖν ἱστορημένων πρὸς μὲν τὸν Ἀλέξανδρον καὶ πρὸ τούτου ἢ πρὸς τὸν Εὐδημον ῥητέον, ὅτι . . .

This passage comes between named references at 10.23 (fr. 32W) and 22.15 (fr. 33aW). Since it is a short reference containing Simplicius' objections, it seems not necessary to print more text. The lemma is Arist. *Phys.* 184a10 and deals with the *archai*; the views of Theophrastus (9.7–10), Porphyry (9.11ff. and 10.25ff.), Eudemus (10.3ff.) and Alexander (10.12ff.) are given on the issue of the different kinds of *archê* and the difference between *archê* and *aition*.

Alexander and Eudemus are mentioned together a number of times, and often Eudemus' view is preferred (cf. Sider p. 24). In this case Alexander was quoted earlier (10.12) as following Eudemus (fr. 32W) in the view that “cause, while being defined in four ways, is said to be an element with regard to matter” (10.13f.). A little later Simplicius also argues against Porphyry on the same issue (πρὸς μὲν τὸν Ἀλέξανδρον . . . at 11.17 is answered by πρὸς δὲ τὸν Πορφύριον, ὅτι . . . at 11.23).

T2. [ad fr. 34W] *In Phys.* I.2, p. 48.26–9 Diels (name at 48.26, 28): ταύτην τὴν τοῦ Εὐδήμου λέξιν σαφῶς ἐκτιθεμένην τὴν τῷ ἰ προβλήματι προσήκουσαν ἀπορίαν ὅλην παρεθέμην τοῖς ζητητικωτέροις. ἢ καὶ ὁ μὲν Εὐδημος τὴν ἐπίκρισιν, ὡς εἶπον, εἰς τελειοτέρας πραγματείας ἢ ἀνεβέβλετο.

This is the closing statement to fr. 34W. The lemma reads “184b25 the question whether being is one and unmoved does not belong to the inquiry into nature” (46.9–10).

Again Eudemus' comments (“I have added to the more problematic questions this quotation from Eudemus which has so clearly expounded

the whole *aporia* relevant to the problem”) are mentioned as helpful in clarifying difficult questions, and the second part of the sentence (“The decision Eudemos also refers, as I said, to a treatise of a more accomplished nature”) emphasizes the agreement on Eudemos’ part to discuss this in the context of metaphysics.

The verb *παρεθέμην* is of some interest in that in the commentators *παραιτίθεσθαι* is almost always used to introduce (fairly) accurate quotations (compare also *παραγράφειν*). A possible exception is Themistius *In De anima*, p. 107.30 Heinze [CAG V.3] *παραιθέσθαι*. Below in T6 there is, e.g., the famous Empedocles passage from his poem (31B17 DK) which is introduced with the same verb (*τὰ εὐθύς ἐν ἀρχῇ παρατεθέντα*, Simpl. *In Phys.* 161.14).³⁷

The words *τὴν ἐπικρίσιν* pick up on 48.9 *κρίνει* and relate to a ‘decision’ on the question whether each discipline is able to find its own *archai* (cf. Arist. *Top.* A 2.101a34–b4).

T3. *In Phys.* I.2, p. 63.19–20 Diels (name at 63.19): *Τὸν δὲ τοῦ μηνίσκου τούτου τετραγωνισμόν παρήκεν ὁ Εὐδημος ὡς ἰσαφῇ οἶμαι*. (“The quadrature of that lune [= crescent-shaped figure] Eudemos skipped as unproblematic, it seems to me.”)

This passage belongs to fr. 140W (*In Phys.* 60–3), but is not printed; it is the closing statement to *In Phys.* 63.10–18 (see Wehrli, p. 62, lines 1–7). In the long fr. 140, reporting passages from Eudemos’ *Geōmetrikḗ historia* book 2, Wehrli has selectively omitted lines from CAG. He

³⁷ See also Wildberg (1993) p. 193f. with nn. who translates ‘ganz genau zitieren’ (but not *verbatim*, *ibid.* n. 20) and points out the very interesting implication that Simplicius does not distinguish between the basic meaning of *παραιτίθεσθαι*/*παραγράφειν*, “marking a text with signs” (in the margin) and ‘quoting’, so that it is possible that Simplicius himself marked citations (adducing *In Cat.* 64.20–5). One may add *τὰ εὐθύς ἐν ἀρχῇ παρατεθέντα*, cf. Simpl., *In De cael.* 135.15, 637.12, 644.5; *In Phys.* 161.15 [less useful 225.22, 1173.32]; also *In Phys.* 83.28 + 725.23 (*μετ’ ὀλίγον*) *παραθήσομαι*, 97.9 *παραθέσθαι*, 175.33 *παρεθέμην*, and 432.20f. [announced in 431.5–6: *μετ’ ὀλίγον ἔσται δῆλον, ὅταν τὴν Πλάτωνος ῥήσιν παραθῶμεν*] Ἀλλὰ καιρὸς μοι λοιπὸν ἐστὶ τὴν Πλάτωνος *παραθέσθαι ῥήσιν τὴν ἐν Τιμαίῳ γεγραμμένην* . . . (quotes *Tim.* 57eff.); 433.14 *πρὸ ὀλίγου παρεθέμην*, 733.4 *μετ’ ὀλίγον τῶν ἤδη παρατεθέντων γέγραφε* (subject is Aristotle, and a quote follows); 1165.20 *παρεθέμην πρὸ ὀλίγου τὰ τοῦ Πλάτωνος αὐτὰ ῥήματα*; 1132.26f. *παραθέμενος δὲ καὶ τοῦ Θεμιστίου τὴν παράφρασιν ταύτης τῆς λέξεως λέγουσαν* (quote follows); 1333.33 (after a long quote from Philoponus) *ταῦτα τοσαῦτα παρεθέμην, ἵνα καὶ τὴν ἔξιν τοῦ ἀνδρὸς τούτου παραδείξω*.

follows Diels in all but two demarcations of Eudemian passages (see his commentary, p. 118, 2nd paragraph and compare my comments to T4).

Wehrli p. 58–66 prints as a continuous text a number of passages which are only divided by short breaks with dots and the phrase “Simplicii interpretatio.”³⁸

By stating *παρήκεν* ... *ὥς σαφῆ* Simplicius reports Eudemus’ silence on the quadrature of the lune. It can be asked whether Simplicius found Eudemus actually *saying* that the matter was clear and therefore needed no comment. Given the brevity of Eudemus in general (see above p. 133), it seems more likely that Eudemus’ silence is *interpreted* as intended, as οἶμαι suggests.

T4. *In Phys*, 69.22–3 Diels: ... *καίτοι τοῦ Χίου Ἱπποκράτους πρὸ Ἀριστοτέλους ὄντος, ὥστε καὶ τὸν Εὐδήμον ἐν τοῖς παλαιοτέροις αὐτὸν ἀριθμεῖν.* (“... since even Hippocrates the Chian lived before Aristotle, for which reason also Eudemus counts him among the earlier mathematicians . . .”)

This short reference comes between named references at 63.19 (fr. 140) and 74.18 (fr. 35) and is connected with a continuous chain of named references to Hippocrates of Chios to fr. 140 (cf. the discussion of T3 on the squaring of the circle).

The use of *ἐν τοῖς παλαιοτέροις* seems a (scholarly?) note on chronology probably from the *Geometr. hist.* As István Bodnár has pointed out to me, this strongly suggests that there was some chronological ordering present in this work. The proof discussed at p. 54–5 (see T3) was mentioned as being found by Hippocrates of Chios, *fl.* end 5th c. B.C. (p. 55.27).³⁹

³⁸ Wehrli only occasionally added the “Simpl. interpr.” as text, noting on p. 117 of his commentary: “Unser Text läßt die erläuterenden Zwischenbemerkungen des Simplicius aus, soweit sie als solche evident sind” (whatever that means). The omitted lines are p. 54.12–55.28; 60.18–61.9; 61.14–27; 61.34–62.1; 62.5–8; 62.10–23; 62.30–63.7 + 8–10 Simpl. interpr.; 63.10–18; 64.7–24; 65.9–10 + 10–23 Simpl. interpr.; 65.7–8 + 65.24–66.2; Simpl. interpr. 66.3–6; 66.6–12; 66.14–67.6; 67.11–68.3; Simpl. interpr. 68.3–6; 68.6–11; Simpl. interpr. 68.11–13; 68.13–32; 68.32–3 (Simpl. concluding statement).

³⁹ For a full discussion of the whole passage (the scholarly literature, the mathematical details of the quadrature of lunes and of the circle), see Heath vol. I, p. 182–202; p. 220–2.

T5. [ad fr. 35 W] *In Phys.* 74.29–30 Diels (name at 74.29): ἀλλ' ἐπειδὴ καὶ τὰ τοῦ Εὐδήμου προσιστόρηται, τὰ κατὰ τὴν λέξιν ἐπιστάσεως ἄξια προσθετέον.

This is the closing statement to fr. 35W and the lemma is concerned with *Phys.* 185a20 “the most proper *archê*.”

In fr. 35W, after paraphrasing Porphyry with approval (καλῶς δὲ ὁ Πορφύριος . . . 74.5–18), Simplicius discusses Eudemus (74.18–29) whom he quotes as giving a more concise analysis of the problem (ὁ μέντοι Εὐδημος συντομώτερον οὕτως ἐπιχειρεῖ τῷ λόγῳ, 18f.).

T6. *In Phys.* 725.23 Diels: καὶ μετ' ὀλίγον τὸν Εὐδημον μάρτυρα παραθήσομαι

This reference comes between named references at 723.36 (fr. 87W) and 732.24 (fr. 88W). The remark is very brief and is easier understood if one adds some of the preceding lines.

The announcement of a quotation further on (μετ' ὀλίγον) discloses an interesting aspect of Simplicius' procedure. The phrase μετ' ὀλίγον/-α is not used very often for this kind of reference ahead: most cases concern the order of exposition in *Aristotle* (a sign of Simplicius' thorough knowledge of the text), some may concern matters of doctrine (e.g., related to time, as in 752.3). When it is used for Simplicius' own working-order, μετ' ὀλίγον is hard to interpret (cf. Barnes et al. p. 4 n. 25). In this case the reference ahead is to p. 732 (= fr. 88 W, as Diels notes in CAG index) which means seven pages further along in our present edition. On other occasions it may be less: as Perry notes (202) at 43.19 μετ' ὀλίγα means “a jump of 45 lines of an OCT text,” while at 180.8 concerning Parmenides “it is unclear how many verses <he> omits.” See also Wehrli's comments (p. 105–6).

On μάρτυρα compare T8 and frs. 37b and 59W; Simplicius seems to have regarded quotation as an essential part of his argument. Perry (see pp. 128, 264–5, 267) points to some interesting examples of quotations where this is more or less implicitly expressed; Simplicius often introduces these by saying that it will be useful and appropriate to “listen to the words” (ἀκούειν, e.g., 644.25) or he reproaches others for not “listening carefully” to the doctrines of the ancient philosophers (e.g., *contra* Alexander at 80.16–17). This cannot be explained only by saying that these notes were meant to be read and listened to (cf. Praechter (1973), the Introduction in Hadot-Hoffman, Barnes et al. p. 6). The

question of the origin in oral teaching of Simplicius' commentaries has not yet been sufficiently studied; cf. ὁρᾶς at fr. 78; cf. *In Phys.* 1165.20 παρεθέμην πρὸ ὀλίγου τὰ τοῦ Πλάτωνος αὐτὰ ῥήματα etc. (I have elaborated this particular point in Baltussen 2001a.)

In my remarks on T2 I have commented on the verb παραθήσομαι.

T7. [ad fr. 86W] *In Phys.* IV.11, p. 717.14–20 Diels (name at 717.15): ταῦτα σαφῶς οὕτω τοῦ Εὐδήμου γεγραφότος ἄξιον ἐπιστῆσαι τί τὸ καθόλου τοῦτο. ("as Eudemus has written these words so clearly it is worth our while to take note of what this general <change> is.")

This is the closing statement to fr. 86W in a discussion of time as the number of change (*Phys.* 4.11), and Eudemus' *aporia*. As to τὸ καθόλου Eudemus speaks of κοινὸν τῆς κινήσεως (*In Phys.* 717.9) and καθόλου (*ibid.* 717.11). This is an example where the Eudemian remarks on the discussion of time are praised for clarity (σαφῶς . . . γεγραφότος fr. 86 = *In Phys.* 717.6–14); Simplicius next paraphrases and develops this in his own words. Here he clearly relies on Eudemus' explanation.⁴⁰

B. PARAPHRASE AND (APPROXIMATE?) QUOTATIONS (T8–12)

Upon further investigation, the omissions mentioned by De Lacy (see above §2) turn out to be in Wehrli's edition after all. It concerns the following passages (some comments on these follow below):

T8. *In Phys.* 118.5–20 Diels (name at 118.6, 9, 19)

T9. *In Phys.* 120.1–12 Diels (name at 120.6)

T10. *In Phys.* 121.5–17 Diels (name at 121.9)

T11. *In Phys.* 138.25–139.3 Diels (name at 138.29, 30)

T12. *In Phys.* 433.13–18 Diels (name at 433.13)

The majority of these are within each other's vicinity and more significantly, close to other occurrences. What has happened is that Wehrli decided (rightly) that some of these occurrences were doublets, decided upon one as the 'original' and in some cases (more) complete quotation, and included mention of the others in the apparatus criticus only. But

⁴⁰ István Bodnár comments on this passage: "The point raised does not concern the existence of horse or man, but rather that of the general man, general horse and general instances of each of the other substances, which is rejected by Aristotle in his repeated refutation of Platonism."

by deciding to relegate the references to less conspicuous positions, he produced an inconsistent treatment of the material. So we are dealing here with the unfortunate side-effects of a particular approach which is not only misleading, but also missing out on interesting aspects of the reports.

In this section I hope to disentangle some of the unclarities resulting from this procedure, and to show that as far as Simplicius' method is concerned, additional insights of interest can be obtained from taking all the material into account. But first I would like to take a brief look at the individual passages.

T8 is found (as are T9 and T10) in Simplicius between 115.11 (fr. 43W) and 133.21 (fr. 44W). It is a comment on Parmenides, discussing his ἐν τὸ ὄν thesis—i.e., it does not represent Eudemus' view on Aristotle (perhaps one reason why Wehrli did not include this passage).⁴¹ The problem of unity and being was a particularly important one for the Neoplatonists (cf. Plotinus, *Enn.* V.1; Wallis p. 55).

Another argument that might be put forward to omit the text is that ἐδήλωσε διὰ τοῦ could indicate it is only a paraphrase. If the interpretation of παρατίθεσθαι (above T2, T6) is correct, the present report, which does not have the verb, would qualify as paraphrase (this does not immediately reflect on the question of accuracy, but does make the task of separating out Eudemus' words more difficult). The substantiated phrasing of the report (διὰ τοῦ κτλ.) is not uncommon, but still less frequent than examples introduced with verbs of speaking or writing (cf. T9–10). Since Wehrli did not give any reasons for his procedure, all this remains speculation.

T9. *In Phys.* 120.1–12 Diels is a partial doublet with 115.25–116.4 = fr. 43W (presumably the reason why W omitted it; Perry [p. 101] mentions that fr. 43 is a fuller quotation). The passage concerns the discussion of Aristotle's very formal refutation of Parmenides (186a22ff., as with Melissos immediately before at 186a4ff.) concerning the multiplicity of being. Eudemus is invoked as witness (ὥς καὶ ὁ Εὐδημος) to the interpretation of Aristotle's words. It is not quite clear to me where the quotation ends (see below).

⁴¹ I note that T8–10 with fr. 43W are fr. 11 Spengel (p. 1144^b CAG index).

It is worth pointing out that the word ἀναξιπίστος is rare (twice in Simpl.: here and 115.25), and, if it is Eudemus', the present case may be the earliest occurrence.⁴²

With the words τὸ συλλογιστικόν we should probably supply σχῆμα—the expression is found only here and at 51.20 (ὁ τρόπος τῆς συνθέσεως ὁ κατὰ τὸ σχῆμα τὸ συλλογιστικὸν ἀμάρτηται); Simplicius (and other commentators) are known for schematizing arguments beyond the original text, in the need to connect Aristotle's practice with his theory of *An.po.* (see also συλλογιστικῶς at 266.5, 384.3, 436.7 etc). The term could be an indication that the quote ends earlier (e.g., after διαψευσθῆναι) or that there is more paraphrase here than is apparent from μαρτυρεῖ λέγων.

T10. *In Phys.* 121.5–17 Diels occurs between named references at 115.15 (fr. 43W) and 133.21 (fr. 44W), in a discussion of the meanings of 'is'; the quote is in 121.13–17 (after γράφει). In his apparatus Diels on line 13 remarks: "cf. 115.22, 118.11." The reference to 115.22 is to fr. 43W, but 118 is to be found only in Wehrli's apparatus on p. 29. I note that the phrase χρῶμα διακριτικὸν ὄψεως is also to be found at Aristotle, *Topics* 119a30–1 (cf. 107b28, 153a38) and *Metaphysics* 1057b8–9, but *not* in *Phys.* Simplicius may be conflating information from different treatises.

T11. *In Phys.* I.3, p. 138.25–139.3 Diels stands between named references at 133.21 (fr. 4W) and 143.5 (fr. 4W). Diels (CAG ad I.30) refers to "fr. 7 p. 14.8 Sp. cf. p. 97.11."

The passage discusses Zeno's thesis against plurality, and Eudemus' role in Alexander's interpretation. Here Simplicius refers Alexander's view on Zeno back to Eudemus, perhaps an indication that Alexander does not always acknowledge the source of his interpretation. It is unclear here whether Simplicius takes Eudemus' view from Alexander or from Eudemus himself, but as we saw in other passages Simplicius did have Eudemus' work.

T12. *In Phys.* 433.13–18 Diels comes between named references at 431.6 (fr. 60W) and 439.17 (fr. 61W). Since this is a short recap given by Simplicius (he refers back to and repeats 431.10–12), some lines

⁴² Cf. Aristoxenus, fr. 51.5 (*ap. Cyrill. Contra Julianum* VI 208), Alexander, *In metaph.* 317.15.

preceding and following should be printed before and after. In his commentary (p. 99) Wehrli refers to p. 430.12 and 432.21; the passage repeats part of fr. 60W (p. 431.10–12). Due to an unfortunate printing error it looks as if fr. 60 does not have a separate entry in his commentary, but as Bodnár kindly pointed out to me (personal message by e-mail): “The entry is not missing but only run together with the one on fr. 50, which ends with the words ‘Zum Ganzen cf. fr. 93’; fr. 59 contained no criticism of Plato, hence Wehrli’s words in the next sentence, ‘mit der analogen Kritik an Platon usw.,’ clearly start the discussion of fr. 60, which criticizes Plato.”

The implicit procedure raises certain fundamental questions about how to edit fragments, and what we should pay attention to in doing so.⁴³ Let me just make one point to illustrate this. Wehrli obviously focused on Eudemus’ words, and was less interested in assessing the source author’s method. But a question which remains unasked from Wehrli’s perspective is why Simplicius should choose to use several passages from Eudemus twice. It is of some interest to speculate on the reasons for this, because it might influence our assessment of the value of the fragments, either because they may turn out to be pawns in the interpretative strategy the source author is privileging, or because it reflects on the limited amount of material available to him.

To make this clearer we may end this section by giving some examples of how Wehrli presents the relations between the doublets and the printed passages (cf. n. 35) reserving analysis to another occasion.

- (i) An example of his inconsistent treatment is fr. 33b (= 42.13–15 Diels), which does present the text, despite the fact that it clearly constitutes a doublet with the second part of fr. 33a (42.14 states “as I also said earlier,” referring back to 22.15—Diels referred ahead at 22.15 and back at 42.14 in his apparatus).
- (ii) In fr. 36 it is left unexpressed that the tagging onto p. 83.33 D. of p. 85.21–86.9 D. is meant to give the passage promised by Simplicius in 83.28 D. (μετ’ ὀλίγον παραθήσομαι τὴν τοῦ Εὐδήμου λέξιν, cf. 725.22–3). Here Alexander’s comments are given first, perhaps an indication of method and preference. As noted earlier (to T1) Simplicius often prefers Eudemus.

⁴³ In this and the following paragraph I owe much to discussion of these issues with István Bodnár.

- (iii) At fr. 37a Wehrli does indicate that he is printing a text which is repeated later (his p. 25 ll. 14–15: “cf. 138.31–139.3 *ubi repetuntur* p. 97.11–16 Diels”). Note also that Wehrli disagrees with Diels on the demarcation of the Eudemus quotation (apparatus to p. 25, line 4). Fr. 37b is a text from p. 242.28 Diels, apparently for correcting the text at 98.1 (Wehrli p. 26.7; see his apparatus: *e fr. 37b supplendum*).
- (iv) In three instances of fr. 43, Wehrli indicates in the apparatus where recurrent passages appear (p. 29): line 4, *repetit Simpl. 118.10*; line 5–6 *denuo citatur a Simpl. p. 118.19 Diels*; line 7 *denuo citatur a Simpl. p. 118.14 Diels*

What this brief overview and short set of comments reveal is the continuous absence of information concerning Wehrli’s procedure in arranging and clarifying the material, demarcating fragments and quotations, assessing the value of context for the fragments, and relating similar material. It is left to the reader to infer why certain texts are printed and others aren’t. Although in some ways his procedure was trivial (e.g., in cutting off fragments too hastily), Wehrli could certainly have made things far more conspicuous by mentioning how he distinguished between ‘original’ and repeated passages, and he could have mentioned these further passages in the title-line, describing the fragment.⁴⁴ When in other cases he only included references to the iterated quotes in the apparatus criticus, it seems mostly material for reconstructing his text. And as stated earlier (see note 10), an index would have made matters even more conspicuous and accessible.

5. Conclusions

In this paper I have given some significant reasons why more work is needed on the material found in Wehrli’s edition of Eudemus of Rhodes (§§1–2, with particular reference to his fragments on physics). I have briefly discussed preliminary questions for a new edition, such as what type of work Eudemus’ *physika* was, and in what form Simplicius may have consulted it (§3). In addition, I presented twelve additional passages or closing lines to existing testimonia from

⁴⁴ In fact he does this with T11, in the title line of fr. 37a, “cf. p. 138.31–139.3 Diels, *ubi repetuntur* p. 97.11–16 Diels.” Cf. n. 38 above on some explicit indications of procedure.

Simplicius' commentary on Aristotle's *Physics*, bringing the total number of named references to Eudemus in Simplicius to around 130.⁴⁵

On the basis of the material studied we can conclude that the added texts do not produce new insights of major import, since the material is limited and taken from the same source as most of the known texts. But even if the shorter references (T1–6) should mainly be added to our collection for the sake of completeness, they may also be taken as evidence that Simplicius is reading Eudemus' notes alongside Aristotle's text: the brevity of such references, it could be argued, show us Simplicius on the look-out for useful comments and adding them whenever they occur. Some of the closing statements, which go beyond the actual quotations, will teach us more about Simplicius' method of demarcating or 'bracketing' his quotes and draw attention to certain features of Eudemus' approach (T2–3, 5, 7). Moreover, we also found a few details which further clarified aspects of Eudemus' role and method in the exegetical tradition. For instance, in T1 we see Simplicius formulate objections against both Eudemus and Alexander, whereas he usually prefers the former to the latter.⁴⁶ In T2 and T7 Eudemus' importance in clarifying a problem is noted. Obviously, we are here adopting a broader approach towards the study of fragments than has been customary until fairly recently.⁴⁷

The longer passages (T7–12) yielded five recurrent 'quotations', or at least passages supposedly reporting Eudemus' words (apart from παρατίθεσθαι I noted verbs such as παραγράφειν, λέγειν). Since they confirm information in similar quotations (such as his discussion of Being T8, of Parmenides T9, of predication T10, and on his method

⁴⁵ Obviously T8–12 do not really constitute additional *material* (in the sense of 'new'). Here no attempt has been made to be exhaustive. That there is more material available in other sources was pointed out by Gottschalk (1973) p. 98: to fr. 7–8: cf. Olympiod. *In Cat.* 13.25; to fr. 79: cf. Philop. *In Phys.* 541.71; to fr. 80: cf. Them. *In Phys.* 119.25; to fr. 100: cf. Them. *In Phys.* 182.24. Apart from the fragments of *In Phys.* (32–123), three fragments (146, 148, 149) come from Simplicius, *In De caelo*. Cf. above n. 5.

⁴⁶ A question which needs further study is whether the regular occurrence of both Eudemus and Alexander in the same context could tell us something about how Simplicius had arranged his notes for writing the commentary. One would expect it to be informative in this respect.

⁴⁷ So far as I know it was not until Edelstein-Kidd's Posidonius edition and translation (vol. I: 1972; vol. II: 1988; vol. III: 1999) that a more restricted and thorough method became applied to fragment editions. See also Burkert et al. and my n. 51.

regarding Aristotle's arguments T12), it was argued that they should at least be taken into account instead of suppressed or hidden away. The additional point we made was that duplication of material can in itself be informative about the value of it for our assessment of the surviving material.

Finally, I have suggested that a probable reason for transmission of the Eudemian material was its value as an exegetical aid to ancient commentators. Simplicius almost treats Eudemus as a 'colleague' who also aimed at clarifying Aristotle's difficult prose (see quote from Wehrli, above note 18). The higher ratio of references as compared to Theophrastus seems an indication that Eudemus' clarifications of Aristotle's thought in physics were regarded as more useful and therefore found their way into later exegetical writings.⁴⁸ Blumenthal (p. 10) has expressed the paradox well: "The general consensus of the commentators after Themistius seems to have been that Theophrastus was a major figure in the history of philosophy whose opinions could nevertheless be ignored on most matters."⁴⁹ Perhaps Simplicius found Eudemus useful as a cure for Aristotle's unclarity: this would explain the emphasis he puts on Eudemus' clarity (note the frequency of σαφῶς) as against Aristotle's—supposedly intended—unclarity (ἁσάφεια, see esp. *In Cat.* 7.1–22).⁵⁰

The unhelpful handling of a small number of references discussed above is only one of several reasons today to re-evaluate the method and form of Wehrli's edition. We have become more than ever aware that editing fragments is not a cut-and-paste operation, but a difficult and complex exercise which needs to take several contexts into account.⁵¹ In this particular case, editing passages as fragmentary bits of text lifted out of their context is perhaps impossible in the traditional

⁴⁸ I have suggested a similar reason for Theophrastus' incorporation into the Platonic tradition in Baltussen (2001b).

⁴⁹ Blumenthal adds (*ibid.*) as a possible reason: "for Theophrastus gave no help to those seeking to impose Platonist constraints on Peripatetic psychology." (Whether this holds for Eudemus needs further analysis.)

⁵⁰ On ἁσάφεια in Aristotle as a *topos* in the late commentators see Barnes (1992) p. 268–70; for its use by Galen see Mansfeld p. 24, 29, 155–61 (cf. his index).

⁵¹ The different contexts are: immediate context of the passage, cultural context of source author, and sometimes the cultural and academic context of the last editor (this holds esp. for 19th century editors). For a number of interesting case studies which illustrate the recent emergence of a more grown-up form of 'fragmentology', see Burkert et al.

way in that Simplicius' prose often does not allow us to lift a text out of its context without losing important information regarding the motives, intentions and overall argument of the source author. As soon as the thoughts and words of a cited author become deeply embedded in the fabric of the immediate context, we need to be as well informed as we can about the source author. There are a lot of unpredictable contingencies in the transmission of earlier thought and common sense tactics such as leaving out 'redundant' duplicate passages may backfire. Therefore it makes sense for each case to be tested on its own merits.

It is these considerations which show Wehrli's edition to be the product of an outdated method and it is hoped that this essay together with the *obiter lecta* culled from reviews (see appendices) will be of use to the next editor of the Eudemian fragments in physics.⁵²

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⁵² The first draft on the topic was written in 1996–97 during an immensely fruitful and productive stay as a Junior Fellow at the Center for Hellenic Studies, Washington D.C. I am especially grateful to Dr. Ellen Roth and staff for superb library support. The paper was circulated to some participants of the Eudemus conference (June 1997) which I could not attend myself. I am grateful to the editors of the proceedings for agreeing to publish it here.

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Appendix 1: Reviews of *Die Schule des Aristoteles* vol. VIII ‘Eudemus’

[Source: *L’Année Philologique*; I note that up until 1957 *L’Année Philologique* lists work on Eudemus separately, from 1957 onwards all work on Eudemus is listed under the entry “Aristotelis Commentatores, Traductores, Sectatores”]

1956–1960 (on the first ed. of 1955) (items marked * were consulted)

- [1]* Des Places in *L’Antiquité classique* XXV (1956) 458
- [2]* Düring in *Lychnos* (1956) 325
- [3] Hendericks in *Tijdschrift voor Philosophie* XVIII (1956) 496
- [4]* Moraux, P. in *Les Études classiques* XXIV (1956) 399
- [5]* Moreau in *Revue des études anciennes* LVIII (1956) 133
- [6]* Rostagni in *Rivista di filologia e di istruzione classica* XXXIV (1956) 322–3
- [7] Chantraine in *Revue des sciences philosophiques et theologiques* XXXI (1957) 124
- [8]* De Lacy in *Classical Philology* LII (1957) 270–1
- [9] Franceschini in *Aevum* XXXI (1957) 102
- [10]* Kerferd in *Classical Review* n.s. VII (1957) 32–3
- [11]* Labarbe in *Revue belge de philologie et d’histoire* XXXV (1957) 396–7
- [12] Levinson in *Journal of Philology* LIV (1957) 821
- [13]* Muth in *Anzeiger für Altertumswissenschaften* X (1957) 234–7
- [14]* Rees in *Journal of Hellenic Studies* LXXVII (1957) 332
- [15]* Drossaart-Lulofs in *Mnemosyne* XI (1958) 266–8
- [16] Market in *Revista de filosofía* XVII (1958) 110
- [17]* Gigon in *Museum Helveticum* XVI (1959) 71–3
- [18]* Smethurst in *Classical World* LIII (1960) 128
- [19] Whatmough in *Erasmus* XIII (1960) 430–1

1969–1972 (on the 2nd ed. of 1969)

- [20] Saffrey, in *Revue des sciences philosophiques et theologiques* LIII (1969) 770
- [21]* Kerferd, G. in *Classical Review* XX (1970) 400
- [22]* Chantraine in *Revue de philologie* XLV (1971) 156
- [23]* see also Gottschalk (1973) 98

Appendix 2: *Obiter lecta* on textual matters, omissions and errors

[All remarks concern the 1st edition. On misprints see also De Lacy p. 271 n. 2.]

Leben (frr. 1–5 Wehrli)

- fr. 1–5: “the appearance of Eudemus in the *Life of Aristotle* (Rose, *Fragmenta*, 1886, pp. 435.19 and 450.5) is not mentioned” (De Lacy p. 271)
fr. 2: “Strabo is not speaking of the city, but the island, as he includes Peisander of Cameirus in his list of eminent Rhodians” (De Lacy p. 270)

Logische Schriften (frr. 7–29 Wehrli)

- fr. 9: “. . . substantive error in Fr. 9. The text concludes with the sentence θέσιν δὲ τὸ πρόβλημα κοινότερον λέγει. There is a corresponding paragraph in the commentary (p. 80) calling attention to Eudemus’ “umfassendere Gesichtspunkt.” But that is not what Alexander’s words mean: the concluding sentence merely explains the use of θέσις in the Aristotelian passage under discussion (*Top.* 2.1, 109a8), and the subject of λέγει is understood to be Aristotle.” (De Lacy p. 270)
fr. 10a–b: “Verweisung auf Prantl (der ja Theophrast und E. unbillig beurteilt) genügt nicht: man soll auch Regenbogen a.a.O. [*RE*, suppl. 7] 1384 hinzuziehen” (Drossaart-Lulofs p. 268)
(10a) “at p. 11, l.4 from the bottom, read ἐπεξευγμένον” (Rees p. 332)
fr. 11d: “Philoponus returns to the views of the ἐταῖροι of Aristotle on p. 124.9” (De Lacy p. 270f.)

ΦΥΣΙΚΑ (frr. 31–123 Wehrli)

- fr. 36 comm.: “at p. 91, on fr. 36, read ‘μέρη διωρισμένα und συνεχῆ’ ” (Rees p. 332)
fr. 37a: “(p. 27, n.1) the lemma should be τάδε” (De Lacy p. 271)
fr. 43.8: “later conjectures of Diels [FVS] ought to have been mentioned” (Kerferd [1957] p. 33)
fr. 60.25: “later conjectures of Diels [FVS] ought to have been mentioned” (Kerferd [1957] p. 33)
fr. 68: the thought of the fr. becomes obscured because W starts in the middle of the sentence “with the resultant loss of the object of κατασκευάζει” (De Lacy p. 270)
fr. 72: “(p. 36, n. [sic] 13) Diels reports that F repeats ἔν τισι and omits τῶν ἀντιγράφων” (De Lacy p. 271) [should be “line 13”]
fr. 74: add two more lines (referred to in commentary) (De Lacy p. 270)
fr. 77: “because σημειωτέον is omitted one can be misled in thinking that φησι is governed by ὅτι” (De Lacy p. 270)

fr. 123b: “There is no reference to some rather interesting similarities between some of the fragments and Proclus’ *Institutio physica* (compare for example Proclus’ first proposition, δύο ἀμερῇ [sic] οὐχ ἀψεται ἀλλήλων [1.1], with fr. 123b)” (De Lacy p. 271)

Tiergeschichten? (fr. 125–32 Wehrli)

fr. 128: “reference should be added to Aristophanes, *Epitome* II. 615, p. 150 Lambros” (De Lacy p. 271)

ΓΕΩΜΕΤΡΙΚΗ ΙΣΤΟΡΙΑ (fr. 133–41)

fr. 140: “(p. 59, line 27) the erroneous ᾧδε was corrected by Diels in his ‘Corrigenda et Addenda’” (De Lacy p. 271)

“(p. 60, n. 1) Diels gives τρόπου F as a variant for πρώτου, not for τρόπον” (De Lacy p. 271)

“(p. 62, n. 2) the note is to the second τὴν in the line (see Diels’ ‘Corrigenda et Addenda’); read *omiserunt* (so also p. 42, n. 22; p. 43, n. 20)” (De Lacy p. 271)

“(p. 62, n. 4) the variants for BG and μεῖζον refer to line 1 (so Diels)” (De Lacy p. 271)

fr. 145: “at p. 68, l.6, place δέ at the end of the line instead of the beginning” (Rees p. 332)

Geschichte der Theologie? (fr. 150)

fr. 150: “For fr. 150 the apparatus criticus could be improved at some six points by comparison with the same work, including Kern’s important change of ἑαυτοῦ to αὐτοῦ in the fragment of Pherecydes, Diels-Kranz⁶, 7A8 which is not mentioned by Wehrli.” (Kerferd [1957] p. 33)

“p. 71, l.12, read πως” (Rees p. 332)

8

Continuity and Coherence in Early Peripatetic Texts

Sylvia Berryman

In his commentary on Aristotle's *Physics*, Simplicius reports Eudemus as having distinguished the concept of *to sumphues* from that of *to suneches*, insisting that the former represents a stronger sense of unity than the latter.¹

Eudemus, however, saw the organically fused (*to sumphues*) as more unified than the continuous (*to suneches*), and said that this was proper to natural things. "This," he said, "is conceptually first and a principle. For on this follows continuity (*to suneches*), being contiguous (*echomenon*) and being next (*ephexês*). But organic fusion (*to sumphues*) comes last in generation (*kata de tèn genesin*)."²

Simplicius' response to this focuses on the question of priority, insisting that weaker kinds of cohesion are conceptually prior: he ignores

¹ I am grateful to Verity Harte, Rafe Woolf and Richard Sorabji for comments on earlier versions. The final version is particularly indebted to Peter Lautner both for corrections in points of detail, and much more for his thoughtful comments. While I cannot do justice to all the valuable suggestions he has made, these will be noted throughout this paper.

² Simplicius in *Arist. Phys.* 879.18–21= fr. 96W; translation by Urmson (1996).

Eudemus' introduction of a new category.³ Wehrli is equally unimpressed with Eudemus' suggestion, noting Aristotle's elucidation in *Phys.* 5, where it is explained that *sumphusis* is last in generation, as the extremes must touch if they are to be fused, *sumphusetai* (*Phys.* 5.3 227a23). Wehrli points to other passages like *Phys.* 8.4 255a12 where Aristotle uses *sumphusis* or *sumphues* as synonyms for *suneches*, as if to suggest that Eudemus misunderstands Aristotle, who is merely clarifying the notion of *to suneches* and not introducing a new category.⁴

But Eudemus' suggestion is surely not idle. Simplicius' report indicates that the suggestion is not merely based on Aristotelian terminology, but that Eudemus offers additional support for taking *to sumphues* as a new category, since it is proper to natural things. The attention given to this issue indicates a heightened sense of the importance of defining and differentiating kinds of unity and coherence: the notion of continuity is not merely, as Aristotle's discussion might suggest, about divisibility. At the risk of making a philosophical mountain out of a terminological molehill, I shall argue that Eudemus' proposal has merit in addressing a problem about degrees of unity and the implications these have for change.

Aristotle's Uses of *Sunechês*

The problem of coherence becomes important at a number of points in Aristotle's discussion of change. Aristotle needs to differentiate the kinds of considerations applicable to homoeomerous masses from those relevant to individuals with internal differentiation. In *Physics* 1.2, Aristotle first uses continuity as one of the ways of expressing unity, distinguishing it from indivisibility and identity of kind (185b7–9). In the course of this argument, the definition of continuous as divisible to infinity is assumed rather than argued. Likewise at the beginning of *De caelo*, the concept of infinite divisibility is used in defining length, surface and body: they are assumed to be continua, although Aristotle acknowledges that he has not as yet established that everything continuous is so divisible (1.1 268a30). This is accomplished elsewhere through a refutation of arguments against infinite divisibility in

³ In his helpful comments on this paper, Peter Lautner proposes that the reason for this stems from Simplicius' disinterest in the biological work.

⁴ Wehrli (1955) 107.

conjunction with an argument that neither smallest parts in contact nor dimensionless points could constitute an extent (*GC* 1.2 316a15–b14). On the assumption that extensions do indeed occur, the impossibility of composition from atomic magnitudes is taken to show that extensions are continuous in the sense of infinitely divisible.

The *Physics* 5 passage, by contrast, considers continuity as one of the degrees of coherence internal to an extended magnitude, ordering these from weak to strong (5.3 227a18–b2). The order of priority is being next (*ephexês*), touching (*to haptesthai*), contiguity (*to echomenon*) and continuity (*to suneches*). Anything touching must already be next, whereas the reverse is not true; the concept of being next applies to abstracts like number that are not susceptible to physical contact. The definitive requirement of nextness is that nothing of the same kind come between. Touching, presumably, excludes any interposition, even of things different in nature. Contiguity and continuity presuppose both succession and contact: in either case the extremities are assumed to touch, while in the former case they seem to remain distinct and in the latter they become one. There is some disagreement about what exactly is meant.⁵ Furley takes continuity to be the limit case of distinctness, as the coincidence of boundaries removes the possibility of calling the bodies “two.”⁶ White proposes, by contrast, that there is no topological distinction between contiguous and continuous bodies, merely that the latter are homoeomerous.⁷ But while a degree of homoeomerity may be presupposed—perhaps by both categories—this fact surely does not override Aristotle’s explicit claim that the unification of boundaries is the definitive factor.

Coincidence of extremes is the explicit definition of continuity in two passages (*Phys.* 5.3 227a10–12; *Metaph.* 11.12 1069a6–8). As there are two major and different notions of continuity explicit in Aristotle’s discussions, it is reasonable to ask whether the notion of continuity as infinite divisibility is merely homonymous with the other sense of continuous as having unified boundaries, or whether a closer connection exists. Aristotle’s view that all extended magnitudes are continuous—i.e., infinitely divisible—would apply, trivially, to exten-

⁵ Cf. Owen (1975) 121–22, on the idea of boundaries “in the same place.” Ross (1936) 627 points out that this passage is unusual in distinguishing *echomenon* from *haptomenon*.

⁶ Furley (1982) 25.

⁷ White (1992) 27.

sions continuous in the sense of sharing boundaries. But divisibility throughout is true of all magnitudes, while sharing boundaries only holds between some pairs of bodies. In the latter case the issue is the point at which or the degree to which two distinct bodies can be said to merge into one.

Aristotle elsewhere suggests how the concepts of infinite divisibility and unified boundaries might be linked conceptually. In *On Generation and Corruption*, it appears that the two notions interconnect via the idea that continuity is a matter of internal homoeomereity. That this is prerequisite for continuity emerges from a number of passages where continuity contrasts to having pores (1.8 326b10) or to the atomist account of internal differentiation into smallest parts separated by void (1.9 327a16–18); in *De caelo*, continuity contrasts to the Platonic account of composition from planes (3.8 306b24). Continuum physics has as foil three views that posit the existence of a microstructure of discontinuous and differentiated parts. It appears from this discussion that continuity is not merely about divisibility, but depends on a certain kind of physical structure based on homoeomerous parts.

This notion of internal homoeomereity is also shown to be presupposed by infinite divisibility (*GC* 1.9 327a10). The atomist claim that division stops at smallest parts, after all, depends on the internal differentiation of matter into atoms and void. This may implicitly rely on the principle of sufficient reason to legitimate the claim that a limit to divisibility depends on the presence of internal differentiation. But the absence of internal differentiation, by the same token, can legitimate the claim that there are no internal boundaries. Again, sufficient reason would require that internal differentiation is presupposed by the idea that there are two different entities; internally homoeomerous substances offer no basis for a distinction into points of divisibility and indivisibility. Inasmuch as the notion of internal homoeomereity shows how the two apparently disparate notions of infinite divisibility and coincidence of boundaries may be conceptually interdependent, internal homoeomereity is the central idea implicit in either definition of continuity. The claim that continuity is equivalent to being equally susceptible (*GC* 1.9 327a9) also assumes internal homoeomereity: it is contrasted with the atomist claim of differential susceptibility. Continuity alone is not of course the only factor in susceptibility, as different kinds of materials are differentially susceptible to different

properties. The point made is that whatever susceptibility a given material possesses is present equally throughout.

This attempt to show that the senses of *sunechês* are not merely homonymous would indicate that conceptual unity depends on treating unities as, at least ideally, homoeomeries. This is fine as a geometrical abstraction, but has limited applicability to the natural world, where unity is not generally based on the absence of internal differentiation.

Uses of *Sumphuês*

Eudemus' proposal to recognize a stronger kind of unity than that of *sunechês* is not without precedent in Aristotle. Aristotle does use the term *sumphuês*, sometimes to indicate a particular sort of cohesion, but also to indicate a high degree of unity, even explicitly to strengthen the term *sunechês*. Theophrastus sometimes pairs the two concepts.⁸ However, the various ways in which the term functions deserve further exploration.

Uses of *sumphuês* that are not overtly explanatory may, like the related concept of *sumphutos*, simply contrast natural with acquired. *Sumphuton pneuma* is merely innate *pneuma*, in contrast to that inspired from outside: the difference of source need not entail a difference in form or function. Aristotle indeed stresses the analogous role of the two kinds of *pneuma* in creatures that do or don't breathe (*PA* 2.16 659b18; 3.6 669a1; cf. *De an.* 2.9 421b13; *Resp.* 6 473a3). Similarly innocuous usages appear in Theophrastus: he mentions a theory according to which it is natural for animals to discern things similar in kind (*Sens.* 1). In his *Metaphysics*, the term used of the outer sphere of the heavens seems to mean "essential" (*Metaph.* 6a; cf. Themistius in *De an.* 108.25), but elsewhere the term extends to characteristics that are common rather than essential: a certain kind of parasite is described as being *sumphutos* to certain ethnic groups (*HP* 9.20.5).⁹

In contrast to such uncomplicated uses stands a stronger sense of *sumphuês* that reflects its etymology, describing things that have "grown together" or become unified organically. An embryo is de-

⁸ Peter Lautner drew my attention to *De lassitudine* 10 on this point.

⁹ In her forthcoming commentary on Theophrastus fr. 307A FHS&G, Pamela Huby discusses the relationship between *sumphuês* and *sumphutos*, pointing to the contrast of *sumphutos* to *exotheren* and *thurathen*. I am grateful for the opportunity to see an advance copy.

scribed by Aristotle as being *sumphuês* within the mother until it is pushed out (*Gen. an.* 2.4 737b17). Democritus' account of *terata* is that two embryos are produced and the parts of both grow together, *sumphuesthai kai epallattein* (*Gen. an.* 4.4 769b33). Uses in *Problemata* to describe a wound closing up (1.32 863a11.30; 32.7 960b40–961a3) suggest healing or returning to a natural state, but the sense of growing together responsible for birth defects rather violates any natural order. A bear's stomach is said by Aristotle to grow together over the winter from lack of food (*Hist. an.* 8.17 600b10). Again, the sense depends on physical union rather than realising the most natural state. This is also true in *De anima*, where Aristotle says that the speed of transmission of sensation would be even quicker were a membrane to be *sumphuês* with the flesh (*De an.* 2.9 423a5). This usage does not imply sameness of kind and must be stronger than proximity: the idea seems to be that the medium is subsumed by, working together with, even under the same control as, the organism.

Theophrastus freely uses *sumphuês* and its cognate verbs in connection with plants, both for a cut growing over or for grafting. In the former uses it is sometimes compared to healing (*CP* 5.16.3) suggesting that *sumphuein* is the technical term for regeneration in plants, equivalent to healing in animals. Plants with a more viscous nature are more prone to heal (*CP* 5.16.4; cf. 3.7.10; *HP* 9.2.6). The use for grafting is noteworthy: grafted parts come to share nutrients and become functionally codependent, without losing the characteristics of the different species they are taken from.

Other passages in Aristotle's biological treatises contrast *sumphuês* or its relatives to *sunechês*, offering precedent for Eudemus' usage. One of these is in a discussion of the separation of the human embryo from the afterbirth, with which it forms a unit at birth but is forcefully separated. Aristotle notes that the part of the umbilical cord up to the point at which it is ligatured becomes *sumphuês* to the child, while that part of the cord merely *sunechês* with it falls off. It is not the physical cutting that marks the natural unit, but the point of ligature; the ligature that stops the flow of blood out from the newborn. The distinction is important, as it marks off physical continuity from organic unity. An organism irrigated by blood forms the kind of unit that will persist and maintain itself as a unit, forming a stronger bond than mere physical continuity or similarity of kind. A similar contrast between mere continuity and functional integrity plays a role in explaining the motion of

animals. Having established that sanguineous animals move on two or four legs and do not survive division, Aristotle turns to the problem of animals like centipedes that move by a much greater number of points but can survive division into several parts. He concludes from this that many-legged animals, while *sunechês* in body, are not a natural unit (*IA* 7 707b3ff.). Aristotle's point seems to be that these animals lack the quality of organization of a creature subject to a single control and working as a unit. The idea of *sumphuês* as codependence appears in discussion of the close relationship and mutual effects between the thighs in the human body (Theophrastus *De lass.* 10.3; *Prob.* 5.26 883b17; cf. *CP* 4.4.8).¹⁰

The technical use for grafting makes clear that bodies that become fused with one another need not be qualitatively homogeneous, either before the process or once it has taken place. True, it is evident that bodies markedly different in kind evade the process: Theophrastus describes stones completely enclosed by a tree growing around it (*HP* 5.2.4), with the clear implication that the stone resists incorporation, and indeed elsewhere uses stones as an example of bodies that do not become *sumphuês* with wood. Parts grown together need to be *homoioopathês*, susceptible in similar ways (*HP* 5.7.2). Lacking the ability to react to stimuli in similar ways, it would indeed be difficult for bodies to function as a unit. One passage recognizes that the resulting graft does not obviate the different character of the plants, which can each take nourishment separately (*CP* 5.5.3). Theophrastus uses *sumphuês* of symbiotic plants grown together of their own accord, saying that the two codependent plants share a single nature if both wither when one is removed or the union broken. By contrast, he resists saying that plants form a single nature, *phusis*, if either were to be harmed by the other (*CP* 5.5.4). *Sumphusis* is marked by function, not form.¹¹

Though functional integrity of an organism offers perhaps the most compelling grounds for differentiating continuity from a stronger sense of persistent unity, the term operates as often in discussions of unity of

¹⁰ Michael Sollenberger suggested a possible source for this view in *Topics*: see his commentary on *De lassitudine*, forthcoming.

¹¹ Peter Lautner doubts whether form and function can be contrasted in this way. I agree with his point that this would create metaphysical difficulties, as function is an aspect of form. However, it seems that where the problem concerns the extent to which two independent organisms constitute a single whole, different considerations might operate.

less differentiated masses. These uses seem to derive their meaning as extended uses of the core notion of “growing together,” inasmuch as functional integration rather than qualitative similarity dominates.

Aristotle rejects a proposal advanced by some accounts of vision that the rays from the eye fuse, *sumphuesthai*, with light from the stars (*Sens.* 2 438a27; cf. Theophrastus *Sens.* 5).¹² The concept seems to be understood here as implying fusion to the point of indistinguishability. The conditions necessary for fusion are suggested in a *Problemata* passage discussing the effect of moisture: water, because it is finer, is able to spread throughout and soften matter, making its parts fuse, *sumphuetai* (21.16 929a15). The image is of wet clay oozing together into a single mass, with the parts not merely juxtaposed but melded around one another to become more compact. The contrast between *sumphuês* and *epaktos*, which in some texts merely distinguishes innate and acquired characteristics, is used in a stronger sense by Aristotle when he compares the case of water soaked into wool to water mixed in milk (*Meteor.* 4.5 382b11). The contrast is of simple admixture to fusion into a new substance from which it is not separable.

There seem to be four different kinds of fusion in these passages: that of two different masses of the same type fused with one other, that of a single mass becoming more agglutinate, that of anhomoeomerous masses forming a new substance and that of anhomoeomerous parts interlocking into an organic unit. In the first case no qualitative change need occur, but, minimally, the two masses become sufficiently fused that no discernible trace of the previous history remains to mark them as distinct. Any division of the fused whole, should it occur, would not be expected to reflect the former lines of separation. In the second case, the melding of a single mass involves a change in the consistency of the parts by the addition of moisture, which makes the substance softer and more able to pack close. The third kind, exemplified by water in milk, involves parts of different type forming a cohesive whole. There, the bonding may arise from the creation of a new homoeomerous substance. The fourth kind of fusion, such as the fusion of two embryos into one, comes from the interlocking of parts that maintain their distinguishable character into an organic individual whose cohesiveness arises from the action of interdependent parts. I have suggested that this

¹² In his comments, Lautner rightly points out that this usage has precedent in Plato's *Timaeus* 45D3–6.

last is the core meaning from which other uses are derived: that *sumphuês* entities form a functioning unit.

Eudemus' Proposal

Eudemus proposes to treat *to sumphues* as a distinct class, more cohesive than things that are merely continuous. If the series Aristotle described were considered as purely geometrical or topological categories, Eudemus' new category would be incongruous: considered mathematically, it adds no new degree of unity. But insofar as the series is thought to transfer to physical unity, Eudemus challenges the adequacy of the original Aristotelian list.

The proposal raises a question about the kind of continuity that is supposed to obtain of natural unities. The highest degree of continuity exhibited by homoeomerous masses, after all, depended on their having the highest possible degree of homogeneity and lacking internal boundaries. The use in Aristotle of *sumphuês* to describe parts so undifferentiated as to be incapable of acting on one another seems at odds with the idea of unity in an organism inherently composed of disparate parts. What would be the analogous bond between stuffs that are not homoeomerous with each other?

Aristotle does in practice suggest that there is a different criterion operative for unity in natural organisms, based not on homogeneity but on interlocking of dissimilar parts. This is expressed in a discussion of the weaving of veins helping to create a bond (*PA* 3.5 668b25). In *Physics* 5, Aristotle had acknowledged this kind of artificial unity in the discussion of joining of inorganic bodies—glueing and nailing and the like—creating a sense in which the boundaries became one. To Aristotle's mind these have less continuity than homoeomerous masses.

If, then, there is any sense to the concept of *to sumphues*, it must be a sense that embraces differentiated organisms as well as homoeomeries. The central idea that recurs through various different uses of *sumphuês* seems to be that of acting as a unit or forming an entity with a tendency to cohere. There are different ways of achieving such unity in organic and inorganic bodies, but these need not be regarded as opposite so much as different ways that the unity could be achieved. In contrast to *sunechês*, the focus is on functional integrity; the degree of qualitative differentiation between parts is inessential. This does indeed indicate the need for a new concept, different in kind

as well as degree from *sunechês*. There clearly are cases where the functional unit differs from that marked by qualitative similarity, where dissimilar masses act as a unit or where the breaking point of functional units occurs at a point of qualitative similarity.

Simplicius' response to Eudemus, as noted above, ignores the proposal to introduce a new variety of unity, instead focusing on the issue of priority (*In Phys.* 879.21–34). The report tells us little about the reasons why Eudemus thought this concept important to distinguish, beyond the fact that it indicated a strong sense of unity and one proper to natural beings. But Eudemus' motivation for placing organic fusion first is worth pondering. If the point is that self-maintaining individuals form the most basic entities because they constitute our sense of what it means to be a unity, then Eudemus is surely right to give priority to the sense of unity proper to an organism. The idea of a coherent body that persists through change stands central to Aristotelian physics, and it is by reference to this that other degrees of coherence can be measured.

Unity and Cohesion in Change

The degree of cohesion clearly has implications for susceptibility to change. In his discussion of qualitative alteration, Aristotle admits that bodies may have points of greater susceptibility—that there may be internal differentiation to some kinds of masses—but regards these as based on differences of degree rather than kind, like that between atom and void. But in *Physics* Aristotle makes an odd concession, agreeing that so long as bodies are *sumphuês* and “one” they are *apathês*, insusceptible, just as are bodies not in contact with one another (8.4 255a12–13).¹³

There are, then, two different ways in which the degree of coherence affects susceptibility to change, and the two are affected inversely by greater coherence. Aristotle thinks that, for qualitative change, matter must not merely be composed of distinct bodies in contact but be continuous. He claims that accounts reducing qualitative alteration to the diffusion of different bodies through pores or void—that reduce it to action by contact—fail to account for qualitative alteration at all, inas-

¹³ Also *Prob.* 13.2 907b31; cf. *Prob.* 35.1 964b24. It is not clear whether invisibility of the *sumphues* stems from homoeomereity or the absence of an intervening medium (*De an.* 2.9 421b9).

much as they do not show how every part could be affected, only how the juxtaposition of different parts arises. But while a high degree of coherence is thus required for susceptibility, there is another sense in which the highest degree destroys it altogether. In a completely coherent mass, no part can act on another.

In fact, there is no incongruity here between the two ways in which qualitative similarity affects susceptibility to change. Achieving the ultimate degree of fusion does not eliminate susceptibility *tout court*, but merely the ability of one part to act on another. The susceptibility of the fused entity to outside influences is a separate issue. Yet insusceptibility is quite at home with the core meaning of *sumphuês*—if this is right—of cohering into a persisting entity. While a tightly coherent entity might still be subject to external influence, it would tend to resist change. This is expressed in one passage of Theophrastus' discussion of nut shells, where that of the walnut is said to persist least because the exterior is least compact and least *sumphuês* (CP 4.2.1). It is most explicit here that being *sumphuês*, because it implies coherence and thus resistance to external impact or internal deterioration, brings with it a greater tendency to persist.

In contexts involving change, it is clear that there is more to be said about the role of cohesion. Aristotle's theoretical discussions of continuity tend to focus on the problem of infinite divisibility of extended bodies, but the mathematical conception of continuity as divisibility does not obviously bear on the kinematics of moving bodies. In practice, he not infrequently describes matter as *sunechês* in quite another sense, one that is explanatory in discussions of change and motion.¹⁴

In *Meteorologica*, hurricanes are ascribed to the cohesion of cloud material, because wind—understood as the dry exhalation from the earth (2.4 360a13)—is continually separating from cloud, so that the cloud follows after (3.1 370b29–371a2). The reason why wind can't separate from cloud but carries the cloud along with it is ascribed to the cloud's density. Apparently the cohesion is greatest where the body is thickest (cf. 1.3 341a2–4; 1.7 344a12). In *De caelo*, the fact that the heavens do not scatter is attributed to two factors: that the revolution of the outer sphere is commensurate with the inner and that the whole is continuous (2.8 290a6). Parity of rotation can at best be a condition for coherence, rather than an active resistance to scattering. The same idea

¹⁴ The reasons for this are discussed in Berryman (1997) 147–57.

is mentioned again in *De motu animalium* (3 699a20), where loss of continuity is threatened should the parts not keep pace. Continuity also features in an argument that the spheres are silent: that the spheres do not strike against one another is cited as evidence against their making noise, with the continuity of one moving sphere to another compared to the fixity of parts of a moving ship to one another (*De caelo* 2.9 291a17). The continuity here again has an implicit notion of adherence: the claim is not that the spheres are smooth or well-fitted to one another and hence frictionless, but that they move as a coherent unit like the parts of a ship. In a discussion of bouyancy, Aristotle suggests that the downward force of the heavy body is counterbalanced by the continuous surface, which has a certain force that is directed against scattering (*De caelo* 4.6 313b17–22).

The idea of an impulse or force in continua preventing scattering depends on thinking of divisibility and sharing of boundaries not only as logical properties but also as physical properties possessed in different degree and affecting the degree of internal coherence proper to the substance. The different capacity for carrying of sound through air is attributed to the relative continuity of the emitted breath (*De aud.* 801a10–b2, 804a38ff.).¹⁵ In texts from the early school, water is said to remain in a clepsydra because it is one and continuous (*Prob.* 16.8 915a17–20; cf. *De sudore* 25).

These passages show that, in practice, the notion of continuity with regard to the motion of homoeomerous substances can have causal implication. The degree of physical cohesion in a substance can be explained as a consequence of its continuity. It is against this background, I want to suggest, that Eudemus' remark should be understood. Even in Aristotle, the sense that continuity is explanatory of the cohesion of bodies can be found, explaining the movement and retention of homoeomerous masses. But the greater degree of cohesion and persistence through change that can be attributed to other kinds of bodies surely called for explanation. In drawing attention to the role of the concept of *to sumphues* in describing the cohesion of organic entities functioning as a persisting unit, and, by extension, of masses that had fused into a new compound more coherent than that of ordinary continuous masses, Eudemus seems to be reflecting just these concerns.

¹⁵ Tad Brennan pointed out this passage to me. See also Alexander in *De sensu* 6 126.19 = Strato fr. 114W.

The coherence of differentiated bodies, based as it is on functional integration rather than homoeomereity, deserves attention.

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9

Eudemus' Unmoved Movers: Fragments 121–123b Wehrli

*István Bodnár**

Aristotle's philosophy of nature is a study of entities which contain principles of moving and rest in themselves. These principles, however, as Aristotle makes clear, are not always sufficient to account for the motion of the natural entities. As *Physics* 8 argues, any moving entity — even the natural ones — presupposes some mover, which is different from the moving object. A further major claim of Aristotelian philosophy is that the chain of movers does not continue to infinity: behind the moved objects there are movers which are themselves exempt from motion, the so called unmoved movers. This doctrine — a criticism of Plato — need not in itself be hostile to the Platonic doctrine of soul as a self-moving motion, which is the sole source of any motion in the world. Even if all Aristotle did was to reassess the status of the souls, the Aristotelian claim would already be strictly speaking true: the mo-

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tion of the world would be derivative of souls, which are unmoved movers.

But the Aristotelian enterprise is more ambitious than that. Not only did he recategorize souls, but in *Metaphysics* 12 he also argued for some further unmoved mover, which is characterised as an intellect, and as an object of love and striving for other beings. The same should hold of the prime mover described in *Physics* 8. If all *Physics* 8 were arguing for were the existence of a supreme celestial soul, the discussions of that book, which substantiate the claim that there are external movers in the case of the motions of ensouled beings, would be grossly misleading.

Aristotle not only establishes the existence of such supra-natural movers; in *Physics* 8 and *Metaphysics* 12 he will also argue for some salient characteristics of these entities. Among these, the two which crop up in the Eudemian fragments can be conveniently labelled relational. Both the question to what extent motion can be attributed to these entities in virtue of the motion of the entities they move, and the question where exactly these entities are located can be meaningfully asked only in relation to the physical entities, from which they are otherwise carefully distinguished.

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The first issue, what motion can be attributed to the prime, unmoved movers appears to be a *contradictio in terminis*. The prime movers were unmoved to begin with, therefore by definition we should be able to stipulate that, provided they exist at all, they should be exempt from all sorts of motion. This, however, is not necessarily Aristotle's official line. The very fact that he argues that immanent souls are unmoved movers, which nevertheless are exposed in an accidental/incidental way to the motions performed by the bodies they belong to suggests that the unmoved celestial movers might be subject to some sort of motion. This possibility, however, will be severely restricted by Aristotle. From the beginning of *Physics* 8.6 Aristotle argues that a prime mover needs to be exempt from all change, both in an unqualified way (ἀπλῶς) and accidentally. Otherwise this moving entity, Aristotle states, could not be eternal, and the motion it induces could not be a single, continuous

and eternal process.¹ This claim is qualified then in the sentence which follows. Aristotle, as if in an afterthought adds:

We must distinguish, however, between the accidental motion of a thing by itself and such motion by something else, the former being confined to perishable things, whereas the latter belongs also to certain principles of heavenly bodies, of all those, that is to say, that experience more than one locomotion. (259b28–31, tr. R. P. Hardie and R. K. Gaye in the *Revised Oxford Translation*)

I shall be discussing the minutiae of this passage shortly. For now I want to stress that some of the celestial moving principles seem to be exceptions to the rule which Aristotle has been arguing for in this chapter. They, Aristotle admits, constitute a whole array of unmoved movers which are able to impart eternal and continuous motion without being unmoved in an accidental way, without being *totally* unmoved.² Unless this is only an infelicitous afterthought on Aristotle's part, we should like to understand how this is possible.

The other passage which might offer some clue concerning the total immobility of the prime mover and the accidental motion of planetary movers is found in *Metaphysics* 12.8. The problem here is that Aristotle says nothing about the contrast we should like to understand. Concerning the first mover, Aristotle tells us that it “is not movable either in itself or accidentally” (1073a24f.). Then he turns to discuss how many prime movers of this sort there are. The chief presupposition of that investigation is that every motion needs a different mover of its own. These movers are going to be characterised in almost identical words as the prime mover, but the crucial specification, that they are also unmoved accidentally is missing. All we learn is that “each of these movements (i.e., celestial movements other than the diurnal motion of the sphere of the fixed stars) must also be caused by a substance unmovable in itself and eternal” (1073a32–4). For all *Metaphysics* 12.8 has to say, these entities might as well be accidentally moved. But they need not be: the *Metaphysics* passage need not deploy a tacit contrast, it

¹ The theme is introduced at 258b13ff. Then the operation of the first mover is contrasted with that of mortal, immanent souls at 259b11ff., esp. 16–28.

² In what follows I shall avoid the cumbersome formulation ‘unmoved also accidentally,’ ‘immobility also accidentally,’ and shall use the phrases ‘totally unmoved,’ ‘total immobility’ instead.

might also stress a few points of similarity between the planetary movers and the prime mover, without implying that there are no further similarities, not spelled out in this passage.

Now that we have seen that *Metaphysics* 12.8 leaves unclear the status of planetary movers, we should summarise our findings, in a terminological way, and return to the discussion of the *Physics* passage. The terminological suggestion I want to make is that we label our understanding of *Metaphysics* 12.8 *contrastive*, if we hold that the mentioning of accidental immobility is lacking from the list, because the movers Aristotle is discussing there are moved accidentally. On the other hand, if we believe that the planetary movers marshaled in *Metaphysics* 12.8 are just as totally immobile as the prime mover at the pinnacle of the cosmos, then we shall speak of a *non-contrastive* reading.³

Returning to *Physics* 8.6 the first thing to note is that any English translation is going to be biased one way or the other. The passage contains a relative clause, and we must decide whether we take this clause in a defining or a non-defining sense. In English — unlike many other languages — this distinction is marked by stress and by orthography: non-defining relative clauses are separated by a comma from the clause they belong to, whereas we do not put a comma before defining clauses. These two types of relative clauses correspond to the two main functions of adjectives: defining relative clauses *select* from among the objects signified by the nominal phrase in the main clause those ones which satisfy the further *restriction* enunciated in the relative clause, whereas non-defining clauses add a further *qualification* about all the entities signified by the nominal phrase in the main clause. (Compare the different functions of the two adjectives in “Everybody was enthralled by the appearance of the Mayor’s ravishing new wife.”)

Accordingly, the crucial difference between these two readings is that with a qualifying, non-defining relative clause Aristotle will assert that some of the celestial moving principles — i.e., [*all* the moving principles] of ever so many spheres that perform several locomotions — are moved accidentally, whereas a defining or selecting relative clause asserts that from among the moving principles of ever so many

³ In an exhaustive list we should also allow for mixed cases: some of the planetary movers might be totally unmoved, whereas others can be accidentally moved. As it will turn out, I will propound an interpretation along these lines of the *Physics* passage, but I do not think such a proposal would make sense in the context of the *Metaphysics*.

celestial spheres that perform several motions, *some* are moved accidentally.⁴ This latter case will not prevent, in fact it will rather indicate, that there are further totally unmoved movers belonging to these spheres.

As should be clear from the above, it is the non-defining reading (the one Hardie and Gaye opted for when translating the *Physics*) which implies that all the movers of these spheres are accidentally moved. This understanding of the passage meshes well with what I call the contrastive reading of the *Metaphysics* passage.⁵ I shall argue for an interpretation of the passage with such a non-defining reading shortly. Before that, however, we should take stock of the implications of the other option, of the defining reading. On that reading Aristotle would assert that accidental motion applies to *some* of the unmoved first principles of *all* of those celestial spheres which experience more than one locomotion. The implication of this assertion is that not all of the movers are accidentally moved: even these spheres will need a totally unmoved mover for their incessant motion. This reading can go with both of the explanations we gave for the *Metaphysics* passage. If we take a non-contrastive understanding of that passage we should expect to find two different series of movers, in a one-to-one correspondence with each other and the sphere they move, and in close interaction. One of each pair will be a totally unmoved intellect, whereas the other will be an accidentally moved entity, presumably a soul of the moving celestial sphere. The other understanding of the *Metaphysics* passage will be more difficult, but not impossible, to harmonise with this option, although at first glance they seem to militate against each other. The *Physics* passage asserted that planetary spheres have both totally unmoved and accidentally moved unmoved movers. The *Metaphysics*, in a contrastive reading would suggest that the planetary movers enumer-

⁴ One might object that this reading of the sentence was made possible by the inversion of the word order. This, however, is not so: the expression "some of the moving principles of ever so many celestial spheres that perform several motions" allows the same reading; inversion of word order was only necessary in order to keep the predicate in the immediate vicinity of the subject of the sentence.

⁵ A non-contrastive reading of *Metaphysics* 12.8, implying that all the celestial movers are totally unmoved, and a non-defining reading of the *Physics* passage, which requires that the movers of the planetary spheres are all accidentally moved, cannot be entertained at the same time, unless one supposes that Aristotle changed his mind about the status of planetary movers. Such a developmental line is propounded by Jaeger p. 364–7.

ated there are accidentally moved. This does not sound promising, and this pair certainly is not my favourite candidate. Nevertheless it is not completely impossible: someone may want to hold that all the planetary spheres have an accidentally moved mover of their own, and at the same time they also strive after a transcendent entity, viz., that which we have already enumerated as the proper mover of the first celestial sphere. This then, can be referred to in an attenuated sense as a mover *of* each and every one of spheres. The *Metaphysics* passage will have it right, because the proper movers of the planets will be moved accidentally, but the *Physics* passage will also be accurate: only *some*⁶ of the planetary movers will be accidentally moved.

2

After delineating these options in a paper on Eudemus the natural thing to do would be to turn to the testimony of Eudemus, and to argue that whatever interpretation is borne out by the Eudemian testimony is the correct one, for Eudemus must have had access to the material of school discussions which settled the issue. I shall argue in this paper that Eudemus' remarks in his *Physics* do not bear out any such expectation. First, however, I need to set out which interpretation of the above passages I find most likely, and why this is so.

As already indicated, I would opt for a non-defining reading of the *Physics* passage. I would do so, because I find all interpretations based on a defining reading slightly odd. These interpretations will in one way or another distinguish between an accidentally moved unmoved mover, something like a soul, and a totally unmoved mover, an intellect. This distinction between, as it were, immanent and transcendent movers would account for the division of labour and the difference of status. What remains perplexing, though, is how this distinction might relate to the fact that the immanent, accidentally moved unmoved movers belong to *planetary* spheres. If every celestial sphere possesses an accidentally moved mover, this will be also true of the first sphere, the sphere of the fixed stars. However, the formulation Aristotle uses in the *Physics* will not allow for this. Hence an interpretation which remains closer to the text is preferable.

⁶ What remains problematic on this interpretation is whether Aristotle's formulation that *some* of the planetary movers are moved accidentally is admissible when in fact *all* of them *save a single one* are accidentally moved.

This is, then, why I would propose to retain Hardie and Gaye's translation, which I have quoted above. The way Aristotle puts his point gives rise to two further considerations. (1) Aristotle does not speak about movers of *planetary* spheres. He rather uses the much more cumbersome description, that his claim is about the movers of those spheres which perform several motions. The reason for this can be twofold. On the one hand he may want to mention this consideration, because it spells out a reason why the movers of these spheres are accidentally moved. But there can be a further reason involved: Aristotle may very well have held when writing the *Physics* that not all planetary spheres perform a composite motion. As long as Aristotle used an orthodox Eudoxan or Callippean celestial system, without the retroactive spheres, each planetary system of celestial spheres contained a first sphere which performed a single, uniform revolution. These first spheres, performing the diurnal revolution, are analogous to the sphere of the fixed stars to the extent that their movers will have the very same status: these will be totally unmoved celestial movers, in contrast to the movers of the further spheres, to which accidental motion will be imparted by the preceding movers.⁷

(2) On the supposition of non-interconnected homocentric systems for each planet we can also see why Aristotle is entitled to the assertion (already mentioned on in note 6 above) that *some* of the celestial movers are moved accidentally. Aristotle's wording will be perfectly apposite in such a celestial setup, because only the movers of the second, third etc. spheres within each planetary system will be accidentally moved and there are going to be seven (or eight) totally unmoved movers besides these.

According to this contention, there may be some difference of doctrine between the *Physics* and the *Metaphysics*, but this difference will be the result only of the slight change in the celestial mechanics which Aristotle advocates in the two works. As soon as all the celestial spheres are integrated into a single, interlocking mechanism, every planetary sphere will be subordinated to the motions of all the spheres above it: the description of the *Physics* will be true of each of the inferior spheres. Accordingly, Aristotle in the *Metaphysics* may intend a con-

⁷ Aristotle has a non-interconnected homocentric system in *De caelo* 2.12. The issue can then be reformulated: it can be asked whether at the time of writing *Physics* 8.6 Aristotle still entertained this celestial model, or already supplemented it with the retroactive spheres of *Metaphysics* 12.8.

trastive reading: whereas the first mover is totally unmoved, all the rest will be ancillary to prior movers, and by the *Physics*' lights all of them will be accidentally moved.

Reading of *Metaphysics* 12.8

	<i>contrastive</i>	<i>non-contrastive</i>
Reading of <i>Physics</i> 8.6 <i>defining</i> <i>(selecting or restricting)</i>	Single accidentally also unmoved first mover and accidentally moved planetary souls. Totally unmoved first mover also mover of the planetary spheres in an attenuated sense	Two movers for each celestial sphere: an absolutely unmoved one (an "intellect") and an accidentally moved one (a "soul")
<i>non-defining (qualifying)</i>	Totally unmoved mover of the sphere of the fixed stars and accidentally moved planetary unmoved movers OR (with change in celestial setup between <i>Physics</i> 8.6 and <i>Metaphysics</i> 12.8): Before the introduction of retroactive spheres the mover of the first sphere in each system of planetary spheres is a totally unmoved mover, whereas all the other dependent ones are accidentally moved by the preceding unmoved movers in the series. Once <i>Metaphysics</i> 12 connects all the celestial spheres only the mover of the sphere of the fixed stars remains totally unmoved, all the others are accidentally moved unmoved movers.	Contradictory readings, possible only if Aristotle changed his mind, see nn. 5 and 10.

3

If my remarks on *Physics* 8.6 and *Metaphysics* 12.8 are correct, I will need to argue that Eudemus misunderstood these Aristotelian passages. Before that, however, we need to establish that fr. 121 (Simplicius *In Phys.* 1262.18f.) is about the status of celestial movers. This needs to be shown, because Wehrli in his commentary on the fragment contested Jaeger's interpretation⁸ and suggested that rather than attributing total immobility to all the celestial movers, what Eudemus intended was a generalisation of the Aristotelian doctrine. Accordingly, not only locomotion would need a spatially unmoved mover, but all other sorts of change: qualitative and quantitative change, plus presumably generation and decay, would depend on qualitatively, quantitatively or substantially totally unchanged entities. There are several things to be queried here. First, we are expressly told at the beginning of *Physics* 8.6 that the prime mover is exempt from all change, be it change without qualification or accidental change (258b13–16). If all Eudemus did in fr. 121 were to stress this point, Simplicius would hardly be justified in saying that Eudemus added a further proviso to what Aristotle had to say. Furthermore, some other passages in Simplicius' commentary on the *Physics* make it, to my mind, inevitable that what he speaks about here is the status of celestial movers.⁹ These passages stress that there has to exist a mover "in the case of each motion" (καθ' ἐκάστην κίνησιν), and they refer to each celestial revolution by the exact phrase which Simplicius will quote in fr. 121 from Eudemus. This means that we can endorse Wehrli's interpretation only at the expense of Simplicius: we can be fairly certain that Simplicius took Eudemus' claim to mean that there is a totally unmoved mover of each celestial motion. Finally Eudemus' formulation would not only be a petty reformulation of what Aristotle says at 258b13ff., it would also be a slightly odd one. Aristotle claims that the prime mover is totally unmoved in *all* forms of change, whereas Wehrli's Eudemus would assert that this

⁸ See Jaeger p. 365ff. and cf. also Merlan p. 25–8.

⁹ See 1254.8f. and 31f. These passages, with which Jaeger could have strengthened his case, were not unknown to Jaeger, in fact he marked these up for himself in his copy of Simplicius' *In Phys.* (now in the library of the Center for Hellenic Studies, Washington, D.C.).

mover is totally unmoved in *each* form of change. The difference may seem trifling, but I think it is not insignificant. Aristotle's formulation is perfectly legitimate, as the prime mover is unmoved in all forms of change, and as far as spatial motion is concerned it is unmoved in itself and also accidentally. This can be summarized by saying that it is unmoved in *all* forms of change both in itself and also accidentally. The putative Eudemian formulation, however, will remain problematic, as the notion of accidental motion and immobility is not introduced for any of the non-spatial changes. We are not told what accidental qualitative or quantitative change, or accidental generation and perishing would amount to. In default of this, what Wehrli's Eudemus says can hardly make sense: we cannot declare total immobility (= immobility in itself and also accidentally) in *each* sort of change, if accidental immobility is defined only in *one* of these.

4

As a consequence of these considerations I concur with Jaeger's proposal: Eudemus introduced a totally unmoved mover for each of the celestial motions. In Section 2, I have already indicated why such an understanding of the Aristotelian passages is unlikely to be correct; therefore, I hold that Eudemus was wrong. How could he be? In one sense of this query, we have already answered it in Section 2 above: in order to establish the existence of totally unmoved planetary movers, Eudemus could have done either of two things. He may have rejected Aristotle's admission of eternal accidentally moved unmoved movers at 259b28ff.,¹⁰ or he interpreted the passage in a way in which there is room for totally unmoved planetary movers besides the accidentally moved ones mentioned there, i.e. with the defining reading of the relative clause there. It is clear that Eudemus in writing his own *Physics*, which is quoted by Simplicius, had the text of Aristotle's *Physics* before him, and he was doing in-depth textual and/or doctrinal analysis of that text. What is also clear is that in his proposals he did not feel compelled to opt for the grammatically and contextually most likely interpretation of the passage: he could either contradict it outright, or he

¹⁰ Jaeger, on p. 366f., after arguing for the interpretation in which it is the celestial movers which are absolutely unmoved, suggested that Eudemus introduced this further proviso into his *Physics* because he was recasting the argument of the Aristotelian *Physics* in light of later developments in Aristotle's thought.

could mold it into the Procrustean bed of a rather unlikely grammatical construal in order to elicit the meaning which he found admissible from a doctrinal point of view. Moreover, Simplicius has an axe to grind when he refers to Eudemos' doctrine: he is part of that metaphysical tradition which holds that the different types of celestial movers have a different status and it is only the transcendent, supra-natural celestial intellects, the objects of desire for the souls of the celestial spheres, which are unmoved accidentally as well.¹¹ Eudemos' admission of absolutely unmoved movers for each celestial motion, therefore, was of no small importance to Simplicius, and the fact that Simplicius does not go into details about the considerations which led Eudemos to this doctrine (e.g., the particular construal Eudemos put on the relative clause in 259b30¹²) suggests that Simplicius did not have access to these considerations. Eudemos' *Physics* apparently contained a parallel version of the Aristotelian treatise, providing doctrinal clarifications, but without giving a detailed discussion of the doctrinal or philological background of these clarifications.

5

After the discussion of fr. 121, I turn to the fragments which attribute to Eudemos a localisation of the unmoved mover. It is not clear of which unmoved mover this localisation is true — of the mover of the first celestial sphere, or of each and every celestial mover. The second option will be objectionable, because then the celestial movers will be attributed locations in relation to the surface of the spheres they move. This would presumably mean that the movers of the inner spheres are interlaid between consecutive spheres. The troubles begin with

¹¹ See Simplicius, *In Phys.* 810.14ff., contrasting natural entities, among them souls, which even if they are unmoved movers in themselves can be moved accidentally, with supra-natural entities. "[I]t will be shown that the supra-natural entities, which are the prime movers, are unmoved not only in virtue of themselves, but that they are not moved accidentally either." In order to be exempt also from accidental motion, these movers should be substances separate from all bodies (cf. 865.20ff.).

¹² It can be important to stress here that the ancient commentators were in a position to distinguish the defining and the non-defining readings of a relative clause. See, e.g., Philoponus *In GC* 278.10ff, commenting on Aristotle *GC* 334b30. Philoponus makes clear that he takes the Aristotelian relative clause in a non-defining way by inserting the word καί in line 16: πάντα δὲ τὰ μίκτα (sc. σώματα), ὅσα καὶ περὶ τοῦ μέσου τόπου ἐστίν.

Aristotle's attempt at a localisation of the unmoved mover, when he asserts that it is there where its effect is the strongest, where the motion induced is fastest. This, as Aristotle makes clear, pushes the mover to the periphery of the sphere, and does not allow for a localisation at the other *arkhê*, the other distinguished locus of the sphere, its centre. But it will generate the same problems as the proposals put forward in Eudemus' name: although Aristotle speaks only about the localisation of *the* mover, and not of each of the celestial movers, if we wanted to apply what is said here to the different planetary movers, we would end up with a series of locations nested between the different spheres. This would not be in accord with what we read at *De caelo* 1.9 279a18–30, where what is beyond the heavens is claimed to be the domain of the divine, and not the interstices between the individual heavenly spheres.

These worries could perhaps be countered by considerations originating from Aristotle's discussion of touch at the end of *GC* 1.6, where we learn that there are cases in which contact is not reciprocal, and as one example the relationship between the unmoved mover and its effects is mentioned. In the course of the report about the localisation of the unmoved mover, Simplicius quotes Eudemus' query to the effect that if the unmoved mover is unextended — as Aristotle establishes in these chapters of the *Physics* —, and if it does not touch the entity moved, in what relation would it be to this moved object.¹³ The upshot of such considerations can very well be that the unmoved mover is localised only as far as its effects are concerned. In themselves all we can say about the unmoved movers is that they do not form part of the physical domain, hence they are beyond the heavens. Since the two considerations attribute a location to these movers from different aspects, in different ways, there should not be any contradiction between these claims. Accordingly we can set aside the original worries concerning which unmoved movers are meant in these localisations: in the

¹³ Fr. 123a, which Simplicius quotes before fr. 122b, the fragment containing the quotation from Eudemus' book which Simplicius was able to provide about the localisation of the unmoved mover. Moreover, it is important to note that the assertion within Eudemus' query, that the unmoved mover would not touch the moved entity, needs to be corrected in the light of the assertions of *GC* 1.6. Accordingly, Eudemus could draw attention to the fact that the touch between mover and moved in this case being one-directional means that the moved entity *is* touched by the mover, without reciprocally touching it.

one-sided sense of the localisation, in the sense of localisation as far as the moved, physical entity is concerned, each celestial sphere can hold the localisation of its unmoved mover.

Unfortunately, however, these considerations do not settle all our problems with the Eudemian localisation of unmoved movers, for two reasons in particular. First, Simplicius speaks of a localisation which Alexander attributed to Eudemos, and then stresses that he was unable to find this doctrine in Eudemos' *Physics*, and the passage he quotes from Eudemos does not bear out Alexander's testimony. Second, the passage quoted by Simplicius makes very little sense as a localisation of the unmoved mover, so even if we rejected the testimony of Alexander in its favour, we would be very hard pressed to extract a meaningful position for Eudemos from the passage quoted by Simplicius.

We should turn to the testimony of Alexander, preserved by Simplicius. According to this the mover is located in a meridian, a greatest circle connecting the poles of the celestial sphere. At first sight this does not appear to be the most suitable choice for the location of the mover: Aristotle in the *Physics*, at 267b7–9, asserted that the prime mover is located where the motion aroused by it is the swiftest. A meridian, the points of which travel at different speeds, and moreover include the poles, two points which are even stationary, is not the most obvious candidate for this role. Nevertheless, on further consideration, the choice of such a greatest circle appears to make sense. Celestial spheres can be visualised as having some breadth, hence each segment of the meridian is at the extremity of a ring parallel to the equatorial circle. Parts of this ring travel more quickly as they are closer to the periphery. If according to Aristotle's dictum one intends to locate the mover somewhere along the periphery, where the motion on that slice of the sphere is fastest, one option is to confine this causal interaction to the two intersections with the meridian. Then every part of the periphery is under the impact of the mover twice on each revolution, when it passes by the points of the meridian circle. This consideration will also provide an explanation for the special status of the poles: it is not problematic that these points are stationary, as no slice within the celestial sphere will belong to them. To this extent Eudemos' proposal would then be analogous to Alexander's, who, as Simplicius reports, localised the unmoved mover on the outer surface of the celestial

sphere,¹⁴ with the fundamental difference that apparently Eudemus applies Aristotle's stipulation about the unmoved mover, that it is indivisible and not extended (*Physics* 8.10), to the localisation of the unmoved mover, to the extent that the locus of the impact of the unmoved mover will be without an extended area, whereas in Alexander's proposal it will be evenly distributed on the periphery of the moved sphere, and hence possess extension there.

As I have already indicated above, the problem with this otherwise not unintelligible proposal is that Simplicius was unable to find any indication of it, although he had Eudemus' *Physics* in hand. What should make us wary in such a case is that the proposal, as presented by Alexander, would fall smoothly in line with Alexander's solution. We need not accuse Alexander of knowingly misrepresenting Eudemus' case; we should, however, remember how easy it is to assimilate the proposal of a predecessor to one's own.

The text Simplicius quotes from Eudemus, however, not only fails to bear out Alexander's interpretation, but also makes very little sense. What Simplicius found did not attribute a localisation directly to the unmoved mover. Rather the assertion that "of the sphere the place around the poles moves swiftest" (*In Phys.* 1355.35f.= fr. 122b Wehrli) might allow for an inference when combined with Aristotle's assertion that the mover is to be found where the motion is swiftest. It does not need a lengthy discussion to see that the proposition quoted, which would be appropriate to establish the localisation of the unmoved mover, is embarrassingly false. As the poles are stationary, the place around the poles should be rather slow compared to other regions of the periphery of the sphere.¹⁵ Furthermore it should be stressed that it is

¹⁴ See esp. Simplicius, *In Phys.* 1354.20, 1355.18–22. (Diels indicates that the quote continues in the following lines, but that is false; at least from line 25 on, we have Simplicius' comments which apparently begin in line 23.)

¹⁵ This is the case if we compare linear velocities along the sphere, and not angular ones. If angular velocities were compared, the whole mass of the sphere would be of the very same speed; with the exception of the stationary axis, every region of the sphere moves with the same angular velocity.

That it is natural to compare these linear velocities rather than the angular ones is a direct consequence of Aristotle's remark that the mover should be where the motion is swiftest. This consideration is mentioned in order to rule out that the mover could be at the other distinguished locus of the moving sphere, at its centre. If angular velocities were compared to each other, as there is no difference among them throughout the sphere, the centre could not be ruled out by this argument.

inadmissible to speak about “*the place* around the poles,” in the singular, as is done in Eudemos’ clause as quoted by Simplicius. There is simply not a single place around the two poles. Hence, Aristotle in *MA* 5 countered the proposal of an unnamed adversary, who claimed that the mover of the celestial sphere is the pair of poles, with exactly this consideration, when he stressed that the single motion of the celestial sphere cannot be caused by the *two* poles.¹⁶

Simplicius’ testimony, then, cannot be construed in a satisfactory way; two conclusions are possible. The less disturbing possibility is that the Eudemos text used by Simplicius was defective. In that case, we need not necessarily reject Alexander’s testimony — he still might have had a complete and accurate text of Eudemos’ *Physics*. However, if Simplicius’ text was neither lacunose, nor problematic at crucial points, then all we can say is that we do not grasp Eudemos’ point, and apparently neither did Simplicius understand him. Moreover, in this case,

It is also important to quote here the considerations of the pseudo-Aristotelian *Mechanics*. Not only because — similarly to *De caelo* 2.8 289b34–5 — there it is repeatedly stressed that greater circles move greater motions, which is appropriate only when comparing the linear velocities of circles moving with the same angular velocity. Also illuminating is the sense in which that treatise can attribute a greater speed to the *smaller* circles, when it asserts in the course of the discussion of the first problem that the “smaller circles always perform a greater motion which is contrary to nature, because being closer to the centre, which draws them back, they are more under its force” (849a17–19). It is important to note that such considerations could not have been available to Aristotle or to a faithful follower of his about celestial revolutions, as they would depend on the rejection of the simple and further non-analysable status of these circular motions. Furthermore, this consideration of the *Mechanics* is valid about circular motions of the same *linear* speed only; there the tendency of declination from the linear motion is greater in the case of the smaller circles. This, however, cannot be so in the case of the motion of the celestial sphere: as that occurs with the same angular speed, greater circles will have a proportionally greater centripetal component than smaller ones.

¹⁶ As the proper motion of a sphere is slowest around the poles, one could suggest that Eudemos’ claim that “of the sphere the place around the poles moves swiftest” is true considering the transmitted component within the compound motion produced by a system of nested homocentric spheres: at the poles the transmitted motion is not under the influence of the additional, proper motion of the sphere. In this instance it could make sense to claim that for the transmitted motion of a sphere the poles are causally responsible. It needs to be stressed, though, that this proposal creates more problems than it solves: it would attribute some gross misunderstanding to Simplicius; moreover, the poles certainly are not first causes, but only transmitters — instruments or at most intermediary causes — of the motion communicated through them.

Eudemus' indiscriminate assertion in fr. 123a, that the unmoved mover does not touch what is moved by it, might be decisive concerning what Eudemus could have said about the localisation of this unmoved mover. We should note that fr. 123b upholds this assertion, and resorts again to the claim that moved movers are in touch [with the object they move] when they cause motion, whereas movers that do cause motion without being in motion themselves are otherwise, differing also among themselves. If these passages are not augmented by a clarification along the lines of the orthodox doctrine of one directional touch between unmoved mover and the celestial sphere moved by it (suggested above in note 13) the *aporia* of fr. 123a remains in force, and Eudemus is not entitled to speak about the localisation of these supra-physical entities. In this case, it is highly unlikely that he would have proposed anything more specific than what can be found in the text of Aristotle's *Physics*.

6

Finally, we should turn to fr. 123b, which discusses the mode of operation of the unmoved mover. Simplicius reports that Eudemus did not discuss the issue raised by Aristotle, whether moving entities can cause continuous motion; instead, he concentrated on the problems whether (and how) the unmoved mover can cause motion at all. Just as in the discussion of the localisation of the unmoved mover it was stressed that it is not in contact with the moved entity, so here again this will be a key consideration. Moving entities, we shall learn, move by being in contact, either immediately or through intermediaries, with the objects moved,¹⁷ whereas unmoved ones operate otherwise, differing also among themselves. Although Eudemus does not explicitly say so, the

¹⁷ It is important to note that Eudemus, before rephrasing in the more general idiom of touch Aristotle's argument, originally formulated in terms of push and pull, mentions, without committing himself, that movers effecting spatial motion are operative through push or pull (τὸ κινεῖν κατὰ τόπον ἢ ὠθεῖν ἢ ἔλκον κινεῖν). Eudemus, then, spells out here an unexposed premiss of the Aristotelian argument. Moreover, he may intend this as a pointer to the discussion where an analysis of motions into push and pull occurs in *Physics* 7.2 (a book which Eudemus did not cover in his *Physics* — see fr. 109 = Simplicius, *In Phys.* 1036.8ff. — as it presumably did not form an integral part of the Aristotelian course on physics), or, alternatively, to passages like *De anima* 3.10 433b25f., *MA* 10 703a19f. or *IA* 2 704b22f., where the reduction of motion to push and pull is announced without further elaboration. (I am grateful to Hans Gottschalk for advice on this point.)

difference between the operation of different unmoved movers can still be that some of them are in contact with the objects moved, whereas the prime mover will not be touched by them. Eudemus' example for the first class, the earth which causes the bouncing ball to move upwards, is an elaboration on Aristotle's example of the wall being the accidental cause of the motion of the ball which ricochets after being thrown by the thrower, the genuine cause of motion both before and after the impact.¹⁸ Eudemus' modification of the original example, the substitution of earth for the wall as a place of rebound, is significant in an important respect. It changes the direction of the throw and, more importantly, of the bounce, and as a consequence the earth will be one of those movers — albeit an accidental one —, which move the moved entity contrary to their own nature.¹⁹ This change connects the two discussions of accidental movers and the movers which move contrary to their own nature, respectively, and makes the original Aristotelian conviction about accidental motion in the case of rebounding more conspicuous: behind the operation of a mover which moves contrary to its own nature there obviously needs to exist another, original one, which elicits this contrary effect. As the result of this combination, the earth will be an unmoved mover here, nevertheless one which can only be causally effective in the wake of another mover: it can deflect the course of motion, but cannot introduce motion into entities which are also themselves unmoved. This example, then, serves as a foil for the case of the unmoved prime mover, which needs to set and keep the celestial spheres in motion on its own, and in accordance with 1355.28–30, it will not be in contact with whatever is moved by it.

7

After the evaluation of the testimony about Eudemus' doctrine concerning the unmoved prime movers, it should be stated that all these

¹⁸ The example recurs in the form of a reminder, compressed into a single principle, at *De caelo* 4.3 311a10f., at the end of the discussion of the moving cause of elemental motion. It is illuminating to compare Eudemus' elaboration of the Aristotelian example with Simplicius' comments at *In De caelo* 706.25f., where Simplicius takes into consideration only a horizontal throw and its rebound.

¹⁹ *Physics* 8.4 255a20–4 contains the distinction between movers according to their own nature, and contrary to their own nature, where the example for the second alternative is the lever (μοχλός) moving the weight or load (βάρος).

testimonies testify to the fact that Eudemus upheld Aristotle's doctrine of prime movers. This gains significance in view of the fact that recent interpreters of Theophrastus argue that Theophrastus rejected this Aristotelian doctrine, and attributed the motion of the heavens to the result of the souls of these spheres, and also possibly to the element composing these spheres. If that were the case, one might be tempted to draw a contrast between the provincial conservatism of Eudemus, returning to his native Rhodes after the death of Aristotle, and the cosmopolitan innovative spirit of Theophrastus, remaining in the intellectually burgeoning climate of Athens until the end of his life. Here I cannot set out in detail why I think such a contrast is untenable, I can only indicate one fundamental reason for the retention of the Aristotelian unmoved movers by Theophrastus.

The most important consideration comes from Theophrastus' *Metaphysics*. That short treatise examines, from beginning to end, the way in which the different domains of the universe are integrated, and claims in an Aristotelian vein that there has to be contact or connection (συναφή) between these domains, otherwise the universe will be as it were episodic, a series of unconnected realms. This claim combined with the testimony that Theophrastus admitted supra-physical entities requires that these entities be integrated with the operation of the cosmos, and unless some other task is explicitly assigned to them, the orthodox Aristotelian role of unmoved movers remains the most likely candidate for their function. The only way out might be to claim that these supra-sensible entities are identical with the souls of the celestial spheres. This, however, will not do, as the mode of operation of the unmoved mover is described in an orthodox manner as the effects of the nature of the object of desire,²⁰ while the role of the celestial souls is consistently described as the subject of desire and aspiration. Unless something can be the object of its own aspiration — which is not admissible on Peripatetic grounds, since then the same entity would possess and would be bereft of the same characteristic at the same time — the motion of the celestial spheres requires an external unmoved mover.²¹

²⁰ See most prominently Theophrastus, *Metaphysics* 5a2f. within the passage 4b18–5a5.

²¹ Or as Sharples tentatively puts it, “[i]t *might* indeed be thought that the heavens being ensouled necessarily requires an Unmoved Mover, if a soul requires some reason for moving” (Sharples p. 87 n. 226). It should be added that Laks and Most in their edition of Theophrastus' *Metaphysics* rightly stressed that the passage 4b18–5a5

Accordingly, if Theophrastus raised difficulties in the context of an Aristotelian account of celestial motion in order to elucidate and elaborate the original Aristotelian position, his project was not fundamentally different from the one pursued by Eudemus in his *Physics*. The fact that Simplicius in his commentary on Aristotle's *Physics* will refer to Eudemus' *Physics* far more often than to Theophrastus' writings will have to do with the nature of these writings, and not with the different philosophical outlook conveyed by these authors.

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recapitulates in broad outlines the argument for an unmoved mover in Aristotle's *Metaphysics* 12; moreover, they explain Theophrastus' final remark in the passage as an allusion to the rejected Platonic scheme of explanation, in which a self moving soul is the mover of the celestial spheres (Laks-Most p. 32 n. 28). As Theophrastus also repeatedly speaks about the motion of the soul, if the two distinct roles of the intellect and the celestial soul were performed by the same entity in Theophrastus' explanatory scheme, Theophrastus could no longer claim with any credibility that he rejected the Platonic self-moving soul as the ultimate cause of motion in the universe.



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10

***Phantasia*, Thought and Science in Eudemus**

Deborah K. W. Modrak

It is a challenge, to put it mildly, to elicit from the fragments of Eudemus a view about the nature of thought or knowledge. Ideally there would be a text or two that speak directly to these issues. There are not. There are, however, a few remarks in his *Physics* commentary that appeal to a certain conception of human cognition. These include passages that discuss perception, imagination and thought and ones that illuminate the relation between observable phenomena and theoretical constructs in Eudemus' thinking. I propose to look at several of these texts. (If one believed with Zeller that the *Eudemian Ethics* was by Eudemus or with Sorabji that the Aelian fragments were authentic, this task would be easier. I am, however, sceptical on both counts.)

I

The first group of fragments, I shall discuss, are nos. 50, 56 and 58 Wehrli. Fragment 50 is about perception; fragment 56 is about chance (τύχη) and intent; and fragment 58 comments on Aristotle's discussion of τύχη and νοῦς in terms of τύχη and τέχνη.

In fragment 50, Eudemus expands upon the opening lines of *Physics* 2.1.

Of things that exist, some exist by nature, some from other causes. By nature the animals and their parts exist, and the plants and the simple bodies (earth, fire, air, water)—for we say that these and the like exist by nature. (192b8–11)

On the face of it, Eudemus' contribution is merely to offer examples of Aristotle's three types of natural existents (animals, plants and elements). For instance, he gives human and horse as examples in the case of animal. Eudemus also notes the distinctive features of these groups, e.g., perception (αἴσθησις) in the case of animals. His efforts are completely consistent with Aristotle's discussion of living things in *De anima* 2.2. It is striking, however, that in a passage where Aristotle goes very quickly through a familiar list, Eudemus sees a need to clarify and to do so in a way that displays his knowledge of Aristotle's conception of animals and how animals differ from plants. He may also be prompted to mention perception as a distinctive attribute of humans and other animals, because the topic is natural science. The object of investigation, the physical world, is the world to which we have access through our senses. As Aristotle puts it in *Metaphysics* 6.1 1025b26–28:

Natural science must be a theoretical science (θεωρητική), but it will theorize about such being as is capable of being changed, and about substance as defined for the most part only as not separable from matter.

Perception is the faculty through which we become acquainted with material bodies and their properties. Notwithstanding, natural science is a theoretical science; the mark of a theoretical science is its exclusive employment of universal principles and concepts.¹ The challenge for Aristotle and for Eudemus as his student is to do justice both to the concrete realities, the understanding of which is the ultimate goal of natural science, and the universal principles that provide that understanding.

Natural science consists in part in discovering and articulating the causal patterns found in nature. Not surprisingly Aristotle recognizes

¹ Although Aristotle on occasion qualifies the description of the universal first principles of natural science using the clause "for the most part," he still construes these principles in a way that does not undermine their claim to universality. See Modrak (1996) 151–70.

the threat that admitting either chance or spontaneity as a proper cause would pose to this project and argues against their inclusion on several grounds. What Eudemus has to say about Aristotle's treatment of chance affords some insight into Eudemus' conception of the intellect.

Eudemus (fr. 56) supports Aristotle's claim that chance (τύχη) belongs to the class of things which are for the sake of something by appealing to the relation between acting for the sake of a good and achieving a mark (ἐπίτευξις) or missing it (ἀπότευξις).² Things that happen to a person by chance are said to be fortunate or unfortunate in relation to some goal. When one acts, one always aims at a good. Chance belongs to the class of things that occur for the sake of something, because it belongs to the sphere of action and action is for the sake of something, namely a good. As Aristotle writes in the opening lines of the *Nicomachean Ethics*:

Every art and every inquiry, and similarly every action and purpose is thought to aim at some good; and for this reason the good has rightly been declared to be that at which all things aim. (1.1 1094a1–3)

Eudemus constructs an argument appealing to ends in order to fill out Aristotle's claim (197a1–8) that choice and thought (διόνοια) are involved when chance is a cause. Not only does Eudemus recognize and act to remedy a lacuna in Aristotle's argument, he also offers an addition that is indicative of a certain picture of human rationality. Insofar as thought is employed in the context of action, it is directed toward an object that is understood to be a good or desirable outcome. The trick for Aristotle and Eudemus is to explain in what way an end is involved in the case of an outcome achieved by chance. The agent's reason for performing the action that has a chance desirable or undesirable outcome is not, *ex hypothesi*, the chance outcome. The solution for both philosophers is to point out that the outcome, although not immediately intended by the agent, is an end that falls in the total set of desired or undesired outcomes that the agent has or would have, were she to attend to a question about a particular outcome.

Eudemus (fr. 58) comments on *Physics* 198a9–13 where Aristotle says that *nous* and nature will be prior to spontaneity and chance as causes of the universe, even if the heavens are due to spontaneity. In-

² Eudemus places chance (τύχη) not spontaneity (τό αὐτόματον) in the category of what is for the sake of something, according to Simplicius *In Phys.* 336.20–27.

terestingly Eudemus explains that nature is prior to art and art is prior to chance. Aristotle appeals to the fact that chance and spontaneity are accidental and not per se causes to justify his conclusion. Eudemus by invoking the notion of art (τέχνη) calls attention to the intelligibility of the outcome. When human *nous* is exercised in accordance with an art, it issues in actions that have predictable and intended outcomes.³ These actions are intelligible. In the case of human actions, *nous* as exercised artfully is a prior and per se cause in contrast to chance. Similarly, by mentioning art in his explication, Eudemus calls attention to the intelligibility of the universe. Its intelligibility explains why nature and *nous* are prior causes.

In Aristotle, there are several overlapping yet distinct notions of *nous* as a psychological capacity.⁴ In some contexts, for instance in *De anima* 3.4, *nous* is simply the faculty for thought. In other contexts, for instance in *Posterior Analytics* 2.19, *nous* is the state of mind that is the apprehension of the first principles of a demonstrative science. In fragment 58, Eudemus tacitly recognizes that the analogy employed by Aristotle depends upon a sense of *nous* that is not readily identified with either of these notions. *Nous* in the sense of intelligence would be highly problematic, because whimsical acts having unintended consequences might, nevertheless, involve thought. *Nous* in the second specialized sense would be more appropriate but still problematic. For in the second sense, an exercise of *nous* would be a component of demonstrative reasoning and demonstration proper does not issue in actions. Thus Eudemus broadens the specialized notion of *nous* to include the apprehension and exercise of the principles of an art. Here the exercise of *nous* would yield concrete results and ones that would stand in sharp contrast to the results of chance.

What may be glimpsed in fragments 56 and 58 is a sophisticated notion of *nous*. The intentionality of *nous* is recognized; *nous* is always directed at something. Moreover, in action contexts *nous* is directed at some good and this is a distinctive mark of rationality. When this aspect of *nous* is codified as a system of rules for achieving predictable and desired outcomes, the result is an art. Science, unlike art, does not bring

³ Cf. *Physics* 2.8 199a21–23; hence some wonder whether the works of spiders and ants and such should be attributed to *nous* (νῶ) or some other faculty; the question arises according to Aristotle because the results of these creatures' actions are similar to results achieved through art.

⁴ See Modrak (1987) chs. 5 and 6.

its universal principles to bear on particular cases according to Aristotle (*EN* 1139b18–1140a16; cf. *Met.* 981b13–25); like all forms of cognition, however, science depends upon perception for its starting points. The mind's ability to manipulate perceptions in a way that generates universals depends crucially on the intentional character of mental representations. In thought, the human mind assigns meanings to the materials provided by sense perception and this enables the mind to apprehend universals. Eudemos, who invokes the intentional character of thoughts governing behavior in fragments 56 and 58, also proves a master at using thought experiments that draw on sense experience in support of Aristotle's positions.

II

The second group of fragments I shall examine are nos. 70, 73, and 74. These appeal to what we can imagine and to what we cannot think in support of substantive philosophical claims.

At *Physics* 3.8 208a5–7, Aristotle wraps up his argument to show that the infinite exists potentially but not actually:

It remains to support the arguments that seem to support the view that the infinite (τὸ ἄπειρον) exists not only potentially but as a separate entity (ὡς ἀφορισμένον). Some of them are not cogent; others can be met by valid objections.

Eudemos (fr. 70) addresses a supporting argument offered by Aristotle, to the effect that just because a thing is conceivable, it need not exist (208a14–22). Generalized, this argument would seem to show that the infinite need not exist as a separate entity just because the infinite is conceivable. A mathematician can conceive the infinite by envisaging the possibility of infinite divisions of a line or infinite additions of units. Eudemos' comment on 208a14 may, however, also be prompted by Aristotle's claim a few lines above (207b33–34) that whether an infinite magnitude (or any other particular magnitude) exists or not makes no difference to the geometer.⁵ Aristotle's solution to one puzzle, namely, that what is conceivable need not exist, seems to threaten other claims he wants to make. If the geometer can conceptualize magnitude apart from body, then the existence of magnitude as an object of thought

⁵ For a discussion of the difficulties raised by 207b33–34, see White (1992) 160.

would not be ontologically dependent on body. In addition, one of the examples given by Aristotle seems to be that of visualizing a person who exists outside the city, and the relevance of this case to the argument is not obvious. Thus the ancient commentators (Eudemus, Alexander, Simplicius and Philoponus) are prompted to explain Aristotle's argument at 208a14–19 that just because we conceive of some state of affairs, it need not exist, in a way that makes sense of his examples. Following Aristotle's lead, the commentators attempt to do this in a way that makes the imagined objects dependent upon actual objects. The ability to visualize and even think of things that do not exist is explained in terms of manipulations performed on known objects. For instance, one can imagine that Diareos is greater in size than the city. This was apparently the suggestion of Eudemus, who interprets the phrase (ἔξω τοῦ ἄστεος)—now struck from the manuscripts by most editors—as a reference to an increase in magnitude. The imagined person is conceived as having a magnitude that is beyond the city's. Simplicius thinks this is the correct interpretation of the example and he has harsh words for Alexander's taking ἔξω τοῦ ἄστεος in the usual sense to mean "outside the city."

There is, however, a more sympathetic reading of Alexander: When the thinker who is inside the city envisages a person outside the city, he recognizes that distance creates a different perception of relative magnitudes. Thus the imagined case is one where there is a gap between the actual magnitude of the person in relation to the city and the magnitude as perceived. On this reading, Alexander has not lost sight of the point of Aristotle's argument, i.e., conceptions of magnitude. However, it would still be correct to say that the change in the relative magnitudes is produced by a change in place not magnitude (κατὰ τὸν τόπον μόνον). On either interpretation of Alexander's explanation, his desire to understand Aristotle's remark in a way that minimizes the role of imagination and maximizes the role of existing objects is evident.

Simplicius believes that Eudemus' simpler explanation in terms of imagining Diareos to be larger than the city is preferable. If we assume that neither Diareos nor the city as a whole are concurrently perceived by the person engaging in the thought experiment, Eudemus is giving the mind much freer reign than Alexander is. The thinker is able in effect to conjure up a person, who may or may not even exist at the time of the thought experiment, to imagine the city, and to juxtapose the city and the man in relation to each other so that, contrary to fact, a human

being, Diares, is larger than the city. Nevertheless, Eudemus, too, is envisaging an object of thought, a nonexistent state of affairs, as a product of thinking about actual objects and actual perceptions of relative magnitudes. One of Aristotle's favorite examples of a nonexistent but conceivable object is the goat-stag (τραγέλαφος), a mythical creature, that, as the name suggests, can be imagined by juxtaposing the parts of two actual animals and constructing in one's mind a composite out of parts of actual perceptions. Simplicius begins with the goat-stag and moves on to the example that he thinks Eudemus has right. Here Eudemus may be, as Wehrli suggests, basing his remarks on *De anima* 418a21 where the son of Diares is used as an example of an incidental object of perception. On the other hand, Eudemus' approach may also be motivated by his desire to allow the mind to manipulate its objects in ways that generate nonexistent states of affairs in some instances but not in others. When proper restraints are imposed, the manipulation of its objects enables the mind to conceptualize theoretical concepts such as geometrical extension and place on the basis of observable objects. The latter is assumed in fragments 73–75 where Eudemus explains how we arrive at the conception of place (τόπος) and why we cannot think about place just in itself.

Before turning to these fragments, one more comment is in order about fragment 70. In the passage under consideration by Simplicius, Aristotle does not mention φαντασία or otherwise emphasize the fantastical nature of the things conceived.

To rely on mere thinking (νοήσει) is absurd, for then the excess or defect is not in the thing but in the thought (νοήσεως). One might think (νοήσεσθαι) that one of us is bigger than he is and magnify him ad infinitum. But it does not follow that he is bigger than the size we are, just because some one thinks (voeî) he is, but only because he is the size he is. (208a14–19)

Simplicius, by contrast, begins by assimilating thinking to image-making: “for it is not the case that if we think something or imagine (φανταξόμεθα) it or dream (ὀνειροπολοῦμεν) it, that it really exists.” That the concept of *phantasia* (φαντασία) found in Neoplatonic authors differs from Aristotle's has been noted by others, the question for us is whether this shift towards a sharp distinction between noetic and quasi-perceptual ones begins with Eudemus. Unfortunately, fragment 70 does not provide sufficient information about Eudemus' contribution to the discussion of 208a14–19 to answer this question. What is clear

is that Aristotle found no need to mark off the kind of mental activity that he is describing as a function of φαντασία. This is not to say that Aristotle would deny that thinking of this sort requires images but he would also say that thinking of this sort, unlike dreaming, is not exclusively the province of φαντασία. Aristotle would no doubt reiterate what he has said about envisaging magnitudes in *De memoria* 449b31–450a8, namely, that it is not possible to think without a *phantasma* but that the content of the thought is not subject to the limitations of the *phantasma*. It is, Aristotle says, possible to think about an object that does not have a definite magnitude by envisaging an object that does, or to think about an object that is indeterminate with respect to quantity as determinate and to think about an object that is a determinate quantity as indeterminate. Because the dependence of thinking on φαντασία does not limit the scope of the thought, Aristotle speaks of thinking where Simplicius speaks of imagining.

The Neoplatonists emphasize the deceptive character of *phantasia*.⁶ The early Stoics who are Eudemus' near contemporaries, by contrast, develop an account of *phantasia* that emphasizes its reliability and its origin in direct encounters with the world through the senses or the mind. One type of *phantasia*, the *kataleptikê phantasia*, is self-warranting, because produced in exact accordance with the object. All instances of *phantasia* in an adult human are *logikai*, i.e., the content of the presentation can be expressed in language. *Phantasia* is an indispensable component of thought on the Stoic account, and this conception, while more elaborate than Aristotle's, is, nonetheless, consistent with his conception of *phantasia*'s role in thought—as Alexander recognizes when he brings in elements of the Stoic account to give a revised Aristotelian account in his *De anima*.⁷ As a mathematician, Eudemus may have been especially sensitive to the need for mental contents drawn from perceptions that can be manipulated in ways that produce concepts such as that of an infinite magnitude. Getting us to think about extending a finite, relatively small magnitude to a much larger magnitude is a first step in showing how we might generate notions of infinity out of ordinary perceptions.

Eudemus develops Aristotle's account of the difficulties surrounding the concept of place (τόπος) by adding that τόπος cannot even be con-

⁶ See, *inter alia*, Watson (1988) 96–133.

⁷ See Modrak (1993).

ceptualized without body (fr. 73).⁸ Τόπος is thought about, Aristotle will argue, as the τόπος of a particular body or the τόπος of a collection of bodies. Aristotle has several objectives here. High on his list is the goal of depriving the receptacle of Plato's *Timaeus* of causal powers except insofar as the receptacle is identified with matter not place (cf. Simplicius in *Phys.* 523.21–23). Plato's reasons for positing the receptacle are not unlike his reasons for positing the Ideas; in both instances Plato argues from what is required for intelligibility (the Ideas) or for an adequate physical explanation (the Receptacle) to claims about what must be. The force of these arguments might be more salient for Eudemus who shares with Plato a serious interest in mathematics than for Aristotle who is much more interested in empirical science.

Eudemus compares place to consonants which can only be heard when combined with vowels; similarly place can only be apprehended (νοῆσαι) as the place of a particular body. The issue here as in fragment 70 is to locate the basis for a concept in the world without thereby putting the concept on the same ontological footing as a concrete object. Yet, unlike the idea of a goat-stag, the concept of place is a theoretical notion required by Aristotle's theory of change. Eudemus' analogy gives us something, a consonant, that really is part of the spoken language but is nonetheless perceptible only in combination with a vowel. The consonant plays a constitutive role without being perceptible in isolation. This is exactly the role of place in explanations of locomotion. To explain that body B has traveled from location I to location M, we must suppose that body B fills a place defined by its outer limits, according to Aristotle. Moreover, the contribution of the consonant, like that of place, is containment; the consonant contains the sound of the vowel. Eudemus' examples are two mutes β and γ; breath (like undefined magnitude) is indefinite until contained.

At *Physics* 209a4–17, Aristotle argues that if place were a body and a body were in a place then, contrary to fact, two bodies would coincide. Eudemus' contribution is to insist that this argument holds not only when both bodies are physical but also when one of the two bodies is mathematical (fr. 74). This is an interesting addition, because it

⁸ Insofar as place has causal efficacy, what is at issue is not only the concept of place as it figures in explanatory contexts but also place as a cause. See Algra (1995, 248–60), who argues that Eudemus both wants to assign some power to place and at the same time deny that place is one of the four basic causes.

shows clearly that Eudemus is again thinking in terms of the theoretical constructs required for an adequate explanation of locomotion. Astronomers as well as mathematicians must and do represent physical bodies as mathematical bodies in order to explain their motions.

And again, is astronomy a branch of the study of nature, or a separate subject? It would be absurd if the student of nature were expected to know what the sun or moon is, but not to know any of the things which of themselves they have supervening on them, especially as it is plain that those who discuss nature do also discuss the shape of the sun and moon, and whether the earth and the cosmos are spherical or not. (Aristotle, *Phys.* 2.2 193b26–31)

One way to understand the mathematical models employed by the astronomer is to treat the geometrical representation of an astral body as a mathematical body that coincides with the physical body. As Simplicius points out (*in Phys.* 531.2–7), astronomers envisage spheres with a common center in order to explain celestial motion. Eudemus recognizes that the reification of mathematical models would collapse the distinction between body and place as well as the distinction between position and place employed by Aristotle at 208b22–25. Thus in a context where Aristotle makes passing reference to incorporeal (ἄσώματα) and conceptual (νοητά) elements to argue that place is neither an element nor made up of elements (στοιχεῖα) (209a14–18), Eudemus considers the coincidence of a mathematical body with a material one. The coincidence of a mathematical body and a concrete body would pose a serious threat to Aristotle's argument that because two bodies cannot simultaneously occupy the same place, place is not a body, and so Eudemus argues against this possibility on the grounds that it would result in the mathematical body being somewhere. This is not a particularly convincing argument, because it depends upon a conception of mathematical objects that a proponent of the view he is rejecting need not accept. What is of more significance for our purposes is the insight this argument provides into Eudemus' conception of mathematical objects and their role in the construction of a physical theory. Eudemus' determination to address the case of the coincidence of a mathematical body with a physical one reveals both his desire as a mathematician to accord mathematical bodies a degree of reality as objects of thought, while maintaining their independence from physical objects, and at the same time his desire as a natural scientist to shore up Aristotle's distinction between place and body. The way to avoid

confusing physical and mathematical properties, according to Eudemos, is to be clear that the only things having places are physical bodies.

Aristotle, as already noted, claims that mathematical bodies have extension and position but not place.

Though <mathematical objects> have no real place, they nevertheless, in respect of their position relatively to us, have a right and left but only in consequence of their position as conceived (νοεῖσθαι), not having by nature these characteristics (208b22–25).

It would be interesting to know what Eudemos had to say about this passage. Since this cannot be known, we can only speculate that this passage may also have influenced Eudemos' recognition that mathematical bodies pose a challenge to Aristotle's conception of place.

In fragments 70, 73 and 74, we see Eudemos struggling with the relation between the theoretical concepts required for natural science and the physical realities from which, according to Aristotle, the theoretical concepts cannot be totally separated. Eudemos' strategy in each case is to attempt to establish the dependence of the concept on its physical basis and show that the separation in thought of a theoretical concept does not establish the independent existence of the concept.⁹ This strategy provides a glimpse into how Eudemos understands human cognitive powers. An important part of his story is the role perceptibles play in the mind's apprehension of theoretical concepts and the employment of these concepts to explain physical phenomena.

III

One of the more revealing texts about how Aristotle thinks about minds in the *Physics* occurs at the beginning of chapter eleven of the fourth book (218b21–219a1). Here Aristotle argues from the correlation of the perception of change with the perception of time to conclude that "time is neither change nor independent of change." Aristotle men-

⁹ Cf. Aristotle. *Post. an.* 2.19 100a15–b3: For when one of the undifferentiated things takes a stand, the first universal is in the mind (for although one perceives the individual, the perception is of the universal, it is, for instance, of man but not of Callias the man). Again in these a stand is taken, until the undivided, that is, the universal, stands, for instance, such-and-such animal stands until animal stands, and in this in the same way.

tions those who are fabled to sleep among the heroes in Sardinia (τοῖς ἐν Σαρδοῖ μυθολογουμένοις καθεύδειν παρὰ τοῖς ἥρωσιν) and not experience the time that elapses (218b23–27). Eudemus' contribution (fr. 84) is to report a similar story about Athenians who after feasting fall into a deep sleep. Eudemus is again supplementing and probably clarifying Aristotle's argument by appealing to experience — the experience of hearing the Athenian story.¹⁰ Aristotle uses the story as an analogy while indicating that it is just a story. His attitude towards the story tends to undercut its usefulness in the argument. Recognizing this, Simplicius, apparently on the authority of Alexander, takes the story seriously.¹¹ Eudemus seems more interested in establishing the relevance of the analogy by pointing out that such stories are told in Athens, too. Whether or not people actually have experiences such as the ones reported here, where a deep sleep occurs over a period of days without any awareness of the passage of time, the ubiquity of the stories attests to the plausibility of the claim that unless change is experienced by a percipient, there will be no awareness of temporal duration. By reminding an Athenian audience of the stories they have heard about members of their own community, Eudemus gets his audience to entertain the possibility of a deep sleep lasting several days and its likely outcome for the sleeper's sense of time.

Just as sense experience is appealed to in order to defend a thesis about time in fragment 84, fragment 103 makes an appeal to experience to justify a claim about motion. In fragment 103, we find Eudemus using a thought experiment to raise puzzles about the relation between the movement (change) of a whole body and the movement of its parts. If we say that the parts change individually, then since all magnitudes are infinitely divisible, the whole will be infinite. Should we deny that the parts move (change) in proportion to the movement (change) of the whole, then our denial would, as Eudemus points out, contradict experience.

If, then, one ought to consider (νοῆσαι) the parts, that what was said seems somehow possible, for both a leg becomes white and so each of the other [parts], and the alterations seem numerically individual; for one [part] may

¹⁰ See R. Sharples (in this volume) who argues that Ross' description of Eudemus as "confirming" Aristotle's account, which seems to conflate two different stories, is wrong because Eudemus substituted the story about the Athenian sleepers for the Sardinian story involving dead heroes.

¹¹ Cf. D. Ross (1979) 597.

become white, and another not become white. These alterations will be the same by kind; and the alteration of all is the same as the alteration of the whole.

Aristotle has just argued that motion like magnitude is divisible and that the movement of the portions of the magnitude will correspond to the portions of the motion (234b22–34). At *Physics* 6.2 233a21–29, however, Aristotle invokes a distinction between infinite extent and infinite divisibility in order to charge Zeno with fallacious reasoning.

Hence Zeno's argument makes a false assumption in asserting that it is impossible for a thing to traverse or severally come in contact with infinite things in a finite time. . . Now it is not possible to come in contact with quantitatively infinite things in a finite time but it is possible to traverse what is infinite in its divisibility; for in this respect time itself is infinite.

What seems like a good solution in the discussion of Zeno in 6.2 — that the division into parts is potential and not actual and hence the whole moving body and the extent of the movement remain actually finite, irrespective of the divisions carried out in thought — seems at odds with the treatment of the parts of a movement as distinct movements in 6.4. To make this puzzle more vivid, Eudemus points out that in the case of alteration, the parts of the change and the parts of the body undergoing alteration are often distinct. He invokes a familiar image, a leg that is white when other parts of the body are not white. In effect, we are then asked to envision a body of which many parts have become white such that we would say without hesitation that the person has altered in coloration — where we might be prompted to exclaim: “You are looking pale!” But now the attribution of a change in color to the whole body appears clearly to be a function of the change occurring in the parts individually. For present purposes, several things are interesting about Eudemus' approach. First, it shows how comfortable Eudemus is with the notion that the intellect can conjure up various possibilities that have consequences which are relevant to deliberations in a context where the objective is knowledge about the perceptible world. The context is, after all, physical philosophy not mathematics or metaphysics, and so the use of thought experiments is more noteworthy.¹² Sec-

¹² Cf. *Physics* 193b31–34: Both the natural scientist and the mathematician deal with these things <planes, solids, lengths and points>; but the mathematician does not consider them as boundaries of natural bodies. . . That is why he separates them; for they are separable in thought from change, and it makes no difference; no error results.

ond, the example makes use of materials drawn from sense experience. Changes in color are quintessential perceptible changes. Color is the proper object of vision and cannot be apprehended apart from vision. Moreover, few objects are as immediate to perception as our own limbs, arms and legs, nor as carefully noted in others as their faces and overall bodily appearance. By constructing this thought experiment, Eudemus reminds us that the intellect draws its materials from the senses, for the very process of considering the example requires us to draw on past perceptions of the shades of human bodies. The example is plausible, precisely because the case of alteration we are asked to think about is a change that is frequently observed.

At *Physics* 244b2–245a11, Aristotle gives what he calls an argument from induction (ἐξ ἐπαγωγῆς) to show that there is nothing intermediate between that which undergoes alteration and that which causes alteration. The role of sensible characteristics as the causes of alteration is crucial to this argument. We do not know what, if anything, Eudemus had to say about this passage, but the discussion of alteration in fragment 103 may well have been influenced by Aristotle's position on sensibles and alteration and his use of induction in this context. Eudemus, moreover, may be putting into practice the conception of induction found in the *Posterior Analytics*. There science is made to depend upon universals grasped through induction.

But induction is impossible for those who have not sense perception. For it is sense perception alone which is adequate for grasping the particulars: they cannot be objects of scientific knowledge, because neither can universals give us knowledge of them without induction, nor can we get it through induction without sense perception. (1.18 81b7–9)

A missing sense, according to Aristotle, will entail a corresponding gap in our knowledge (81a38–39). Universals are not only derived from sensible particulars but they are also introduced to the person acquiring a science through induction from particulars, Aristotle claims (81a39–b6). Eudemus appeals to sense perception to set up a puzzle about the relation between the parts of a change and the parts of the body that is changed. This puzzle challenges the extension of a finding about locomotion to alteration and growth. In effect, Eudemus uses the Aristotelian method of induction to generate two competing interpretations of Aristotle's claim that there is a single change for a single magnitude and the constituent parts of a given magnitude have their

own changes which are parts of the change of the whole. In the case of locomotion, the movements of the parts, like the parts themselves, must be viewed in a way that maintains the finitude of the moving body, its parts and the distance transversed. In the case of alteration and growth, the change of the whole is actually in proportion to the changes of the actual parts, as Eudemus points out.

In fragments 84 and 103, Eudemus appears to be using Aristotle's inductive method both to explicate and support Aristotle's positions and to test them. In both fragments, the appeal to sense experience provides a glimpse into how Eudemus thinks about minds and the role sense perception plays in the formulation and explication of universal claims in natural science.

IV

The fragmentary evidence suggests that Eudemus' interest in cognition in the *Physics* commentary is primarily driven by his desire to apply Aristotle's method of induction in support of a science that Aristotle characterizes as about perceptible objects. Eudemus seems to recognize clearly, perhaps more clearly than Aristotle did, the tensions existing between an empirically based theory of universals including theoretical constructs and the requirements of the physical theory Aristotle sets out in the *Physics*. Aristotle uses concrete examples and appeals to perceptibles throughout the *Physics*, and so he in effect acknowledges the importance of bridging the gap between theory and perceptibles. In the third century, both the Stoics and the Epicureans confronted a similar challenge, and the Stoics' resolution was found in their conception of *phantasia*. On the basis of the Eudemean *Physics* fragments we cannot conclude that Eudemus adopted the same strategy; however, we can conclude that he recognized the problem and took it very seriously.¹³

¹³ I would like to thank the other participants in the Project Theophrastus conference — especially K. Algra, H. Gottschalk, P. Lautner, and R. Sharples — for helpful comments and queries on the topics covered here.

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11

Eudemus the Naturalist

Stephen A. White

Eudemus is named eight times as an authority on animals. Apuleius counts him among the pioneers of Greek zoology (fr. 125), and Aelian cites him for seven reports in his vast farrago of animal lore (fr. 126–32). These *Tiergeschichten*, as Wehrli labels them, all describe unusual behavior: gulls crack open shellfish by dropping them from the air (NA 3.20), a pair of lions kill a bear with a woodsman's help (3.21), a colt tramples a groom (4.8), a tame lion kills a tame bear (4.45), a nameless Libyan carnivore divides up its prey (4.53), a seal cavorts with a diver (4.56), and a monkey eludes a pack of cats (5.7). By themselves, these reports seem too trivial or bizarre to merit serious study. In Aelian, where hundreds more surround them, they are meant to display the amazing ingenuity of animals. Loss of the original context makes it hard to see their scientific import, hence tempting to deny they come from Eudemus of Rhodes.¹ Scepticism, however, is unwarranted. Similar doubts have often been raised about parts of Aristotle's *Historia Animalium*, especially Book 9 on behavior. But recent work on its or-

¹ Martini col. 901: "so über die Massen albern und aberwitzig, dass es schlechterdings unmöglich ist, sich den ernstgerichteten, strengwissenschaftlichen E. von Rhodos als ihren Urheber vorzustellen"; cf. Zeller p. 870, Dierauer p. 169–70. Wehrli (1955. p. 112) voices similar doubts but ventures no verdict; cf. Wehrli (1968) col. 657.

ganization, method, and aims has answered most complaints.² Closely related interests, I shall argue, motivate the reports Aelian ascribes to Eudemus. Comparison with material from Aristotle and Theophrastus will show how he too contributed to the program of biological research in the early Lyceum. Like his colleagues, Eudemus was a naturalist in two basic respects: he sought both to record accurate observations of animal behavior and to interpret this behavior as the expression of natural capacities.

1. Authenticity

The question of authorship hinges on the reliability of our sources. Is it clear that both Aelian and Apuleius refer to Eudemus of Rhodes? If so, should we trust their testimony? The name is very common, and neither source identifies Eudemus more precisely.³ But there is no question whom Apuleius has in mind when he defends his own study of zoology by naming his most illustrious predecessors.

[My accuser] should read the great works of the ancient philosophers, so he may well understand that these things were first studied not by me but long ago by my forebears — I mean Aristotle, Theophrastus, Eudemus, Lyco, and the rest of Plato's followers,⁴ who have left behind numerous books on the reproduction of animals, on their behavior, on their parts, and on all their distinguishing features [*plurimos libros de genitu animalium, deque victu, deque particulis, deque omni differentia*]. [*Apol.* 36.3–4 = fr. 125]

Named alongside Aristotle and Theophrastus, this Eudemus must be their colleague. Further identification would be pointless unless Apuleius had someone else in mind.⁵ But should we trust the testimony of a defendant in a capital case in Roman Libya c. 158 CE, over four

² See Balme (1991) p. 1–26; Lloyd (1983) p. 20–26; Huby (1985); Balme (1987); Gotthelf (1988); Lennox (1991, 1996). I follow the traditional sequence of books in citing *HA* 8–9, though Balme (1991) restores the order found in older mss. where 8–9 precede 7.

³ *LGPN* 1–3A list 265 (including Doric Eudamos, common on Rhodes); *RE* lists 28, including five other plausible sources for Aelian's reports: a writer on anatomy associated with Herophilus (no. 17); an Argive lexicographer of unknown date (no. 15; a citation discusses a kind of snake); a first-century medical writer who versified some animal lore (no. 18; cf. *SH* 412A); and two associates of Galen, a Peripatetic (no. 12) and a physician (no. 19).

⁴ The Platonist Apuleius calls Aristotle and company his own teachers and predecessors (*maiores meos*) but Plato's students and inferiors (*Platonis minores*).

centuries after Eudemus, especially one whose talent for invention is amply demonstrated in the fantastic tales of his *Metamorphoses*? His mention of Lyco may encourage doubt, since zoological work is not otherwise attested for the Peripatetic so named.⁶ Yet even if Apuleius is mistaken about Lyco, the detailed knowledge of Greek science and philosophy displayed in this speech make him an especially credible witness.

Apuleius was accused of using magic to win the hand of a wealthy widow, and the allegations included the use of peculiar fish to bewitch her. In rebuttal, he mocks the prosecution for their ignorance and explains that his alleged sorcery was in fact serious ichthyological research (*Apol.* 29–41).⁷ After naming his famous predecessors in zoology in fr. 125, he compliments the judge — the eminent and learned proconsul Claudius Maximus, a close friend and mentor of Marcus Aurelius (*Med.* 1.15, cf. 1.17.5, *Hist. Aug. Marc.* 3.2) — on his erudition before flaunting his own learning in a long digression peppered with Greek titles and technical terms.

It's good the case is being tried before you, Maximus, who for your edification have of course read Aristotle's multi-volume works *Περὶ ζώων γενέσεως*, *Περὶ ζώων ἀνατομῆς*, *Περὶ ζώων ἱστορίας*, as well as the countless problems by him and the rest of this school, which address various matters of this sort. [*Apol.* 36.5]

Two of these “multi-volume works” (*multiiuga volumina*) survive, as do 38 books of “problems”; and the work on “dissection” is well attested. All three titles also appear in the ancient lists of Aristotle's works. The first, clearly the extant *GA*, is listed in both the Hesychian appendix (no. 158 *Περὶ ζώων γενέσεως* in 3 books) and the Arabic version of Ptolemy's catalogue (no. 50 *Περὶ ζώων γενέσεως* in 5 books, cf. nos. 88, 90), which reflect the editorial work of Andronicus

⁵ Earlier in the speech, Apuleius specifies “Zeno of Elea” (4), then “Zeno the founding Stoic” (9).

⁶ Wehrli (1955) 112; cf. Sharples (forthcoming). Capelle (col. 2306) proposed emending *Lyconem* to *Stratonem*. Another possibility is that Apuleius had in mind a contemporary of Eudemus, Lycus of Rhégium (*RE* no. 50) — perhaps he wrote *Lycum* — whose lost works on Sicily and Libya included reports about animals (*FGrH* 570, esp. fr. 6, 11, 13) preserved alongside Peripatetic material in ps.-Ar. *Mirab.* and ps.-Antig. *Paradox.* (fr. 13 in *Paradox.* 60 divides two long sequences of excerpts from *HA*); cf. Flashar (1972) p. 45.

⁷ For the case, the speech, and its displays of learning, see Harrison p. 39–88.

in the first century BCE.⁸ The second, probably a lost work cited occasionally in extant works, is listed in the older catalogue recorded by Diogenes Laertius (5.25 no. 103 Ἀνατομῶν in 8 books) and Hesychius (no. 91 Περὶ ἀνατομῶν in 6 books), which probably goes back to third-century Alexandria if not to the Lyceum itself.⁹ The third, almost certainly our *HA*, appears in both pairs of catalogues (D.L. no. 104 = Hesych. no. 93 Περὶ ζώων, each in 9 books; Hesych. no. 155 Περὶ ζώων ἱστορίας = Ptol. no. 48 Περὶ ζώων, each in 10 books).¹⁰ Apuleius also knew what these works discuss. His summary descriptions in the preceding lines not only evoke the modern titles for two works (*de genitu* for *De generatione*, *de particulis* for *De partibus*); they also specify both the three main topics of *HA* (reproduction, habitat and behavior, morphology: *HA* 5–6, 8–9, 1–4) and the focus of the work as a whole (*de omni differentia*).¹¹

Apuleius was also familiar with related work by Aristotle's colleagues. Here he mentions the “countless problems” (*problemata innumera*) discussed “by the rest of this school” (*ex eadem secta ceterorum*).¹² Later in the speech he names three opuscula by Theophrastus, two on zoology and a third on physiology: Περὶ δακέτων καὶ βλητ(ικ)ῶν, which he claims to have read along with Nicander's hexameter *Theriaca* (*Apol.* 41.6 = fr. 360 FHS&G); *De invidentibus animalibus* (i.e. Περὶ τῶν ζώων ὅσα λέγεται φθονεῖν), from which he cites a folk remedy for epilepsy (*Apol.* 51.6 = fr. 362B FHS&G); and *De caducis* (i.e. Περὶ ἐπιλήψεως), which he cites along

⁸ Titles are numbered as in Gigon p. 22–28, 39–45; cf. Düring p. 41–50, 83–89, 222–31. On the origin of the catalogues, see Moraux (1973) p. 45–94; on their contents, Moraux (1951), esp. p. 107–9 on the zoological works.

⁹ On the lost *Dissections*, see Stückelberger. The singular ἀνατομῆς may be corrupt: *Apol.* 40.5 has *libros ἀνατομῶν*, and the mss. regularly garble Greek. On the catalogue, see Moraux (1951) p. 211–47.

¹⁰ *HA* was standardly called Περὶ ζώων even after Andronicus, as Theophr. *HP* was widely cited as Περὶ φύτων (see F384 no. 1 FHS&G), though each refers to his own work as ἱστορία/ι; cf. Lennox (1994) p. 15–16.

¹¹ Balme (1991) p. 13–19; cf. n. 2 above. Apuleius followed this sequence in his own work: *progignantur . . . deinde de differentia et victu et membris et aetatibus ceterisque plurimis* (*Apol.* 38.2–4).

¹² “Countless” is apt: the extant 38 books (so D.L. no. 121 = Hesych. no. 110) contain nearly 900 problems, other sources refer to 70 books (*Vita Marc.* 4, ps.-Antig. *Paradox.* 60, Elias *In Cat.* 114), and the Theophrastus catalogue lists several more; cf. Ar. fr. 209–45 R (21 from Plutarch, Gellius, and Galen), Flashar (1975) p. 303–16, 356–58.

with a passage from Aristotle's "problems" (fr. 240 R) to explain why he diagnosed a case of epilepsy as intractable (*Apol.* 51.4–5).¹³ None of this proves conclusively that Apuleius knew these works directly. But it does show that he was well informed about the kind and range of biological research carried out in the early Lyceum.¹⁴

Apuleius' study of zoology is integral to his defense and he flaunts his expertise repeatedly. After listing Aristotle's works, he claims he is compiling works of his own on the same topics "better organized and more concise [*ordinatius et cohibilius*], in both Greek and Latin, and on all matters filling gaps and mending defects" (*Apol.* 36.6). To back up this claim, he has excerpts read to the court from what he facetiously calls "my magical works" (36.7): first a work in Greek that covered fishes (*quaedam de piscibus*, 37.4; cf. *e Graecis meis*, 36.8), then his parallel version in Latin (*pauca etiam de Latinis scriptis meis . . . recita Latine a me enuntiata*, 38.5–9). Between these excerpts, he summarizes the topics covered in his Greek work, then recites Aristotle's main differentiae for aquatic animals in Greek (38.2–8).¹⁵ But Apuleius displays more than a firm command of zoological nomenclature, and his project of translating Greek zoology into "Latin coinage" (38.5; *viviparus* and *oviparus* are first attested here) involved more than compilation. He also did research of his own "to confirm and supplement" his sources (*et explorare studio et augere*, 40.5). By dissecting a "sea-hare" (apparently a sea-slug), for example, he discovered that this ostensibly "boneless" mollusc has multiple bony structures, a fact recorded by none of his sources (*Apol.* 40.8–11).¹⁶ Other reports suggest a taste for marvels, at least in his audience: the peculiar anatomy of the "sea-donkey" or hake, which has its heart "in the middle of its gut" (*Apol.* 40.11, cf. Ar.

¹³ All three appear in the first section of the Theophrastus catalogue (D.L. 5.43), which contains nearly all the titles attested elsewhere; see Sharples (1995) p. 67–84; White (2001); and n. 38 below.

¹⁴ This is the only extant mention of *On Epilepsy* outside the catalogue in D.L. The gecko report, though widely attested (ps.-Ar. *Mirab.* 66, ps.-Antig. *Paradox.* 20, Pliny *NH* 8.111, Ael. *NA* 3.17), is explained only here and in Photius (fr. 362A FHS&G); the passages correspond closely, recounting both Theophrastus' description and his explanation (*naturali adpetentia* for φυσικόν τι ποιῶν πάθος in Phot.); this suggests that Apuleius, like Photius, knew the work firsthand.

¹⁵ This list derives from *HA* (cf. 1.5–6) but probably via the *Epitome* by Aristophanes of Byzantium, which glosses a longer list of terms in much the same sequence (1.1–22; cf. Ael. *NA* 11.37). Apuleius' list of topics for his own work (see n. 11 above) also follows the sequence in the *Epitome*; see *Epit.* 2.1; De Stefani p. 429–32.

¹⁶ Butler and Owen (p. 98) verify his observation; cf. Thompson (1947) p. 142–43.

fr. 326 R, Ael. *NA* 5.20, 6.30);¹⁷ the ovoviviparous (i.e. only internally oviparous) birth of vipers (*Apol.* 85.5, cf. Ar. *HA* 5.34, Theophr. fr. 382 FHS&G, Pliny *NH* 10.170, Ael. *NA* 1.24); and the famous symbiosis of crocodiles and plovers (*Apol.* 8.6–7, cf. Ar. *HA* 9.6, *EE* 7.2, ps.-Ar. *Mirab.* 7, ps.-Antig. *Paradox.* 33, Pliny *NH* 8.90, Ael. *NA* 3.11). All of this data is also recorded in Aristotle, whose aim was not to collect marvels but to isolate distinctive features (cf. *proprietaem*, *Apol.* 40.9) for further study and analysis. Apuleius' examples do not impugn his learning. On the contrary, they imply that he recognizes the general norms to which they are exceptions.

Apuleius may well exaggerate his interest in zoology. But he was clearly familiar with its study in the early Lyceum (contrast Cicero's cursory description in *Fin.* 5.10). Interest in this work had grown considerably during the two centuries since Andronicus, and like his contemporary Galen, Apuleius could find works by Aristotle and his colleagues in many places.¹⁸ Born c. 125 CE to a prominent and wealthy Roman family in the thriving city of Madauros in Numidia, he pursued advanced studies in nearby Carthage, whose fine libraries he extols (*Flor.* 18 and 20; cf. Pliny *NH* 18.22), then studied science and philosophy in Athens, where he cultivated his interest in Platonism.¹⁹ After a stay in Rome, he returned to Carthage, married, settled in the city of Oea (modern Tripoli), and enjoyed wide acclaim for his eloquence and erudition. Apuleius thus had access to works from the early Lyceum in both Athens and Rome, probably in Carthage, and perhaps even in Oea, since he mocks his prosecutors for not "taking the books out of the libraries and ripping them from the hands of studious readers" (*Apol.* 41.4).²⁰ His project of translating and supplementing Greek zoology gave him reason to consult all available works, and his respect for Aristotle and his colleagues would have made work by Eudemus especially attractive.

¹⁷ *HA* 2.17 507a26–30 suggests an explanation; cf. Thompson (1947) p. 182–3.

¹⁸ For Galen's knowledge of Aristotle's works, including his zoology, see Moraux (1984) p. 729–35, (1985).

¹⁹ For his background and education, see Harrison (2000) p. 1–9. Chronology suggests that he studied under Taurus in Athens, perhaps alongside Gellius, who records Taurus' special interest in Peripatetic "problems" (*NA* 19.5–6, cf. 3.6, 4.11); see Dillon (1977) p. 237–47, 306–7.

²⁰ *Apol.* 90–91 lists Zoroaster, Moses, and six other "magi" whose works Apuleius "read in famous writers in public libraries."

There is also good evidence that Apuleius could consult Eudemus, though we cannot be sure he did. Works by Eudemus had circulated for at least a century. The earliest extant reference to him is in Strabo (fr. 2), who had studied under the prominent Peripatetics Xenarchus (*Geog.* 14.5.4) and Boethus (16.2.24). But Strabo says nothing about his work, which is first mentioned by Plutarch (fr. 49 from his *Physics*), and first cited by Dercyllides, who used his study of early astronomy (fr. 145).²¹ Gellius, who studied in Athens the same time Apuleius did, recounts an anecdote about Eudemus (fr. 5) but never mentions his work. Galen, however, knew his work on logic (fr. 29) and compiled three books of notes on it (*De Libr.* 14 p. 123 M, cf. p. 118). Around the end of the second century, Clement of Alexandria cites his study of astronomy (fr. 143), as does Diogenes Laertius (fr. 144), and Alexander of Aphrodisias knew both his logic (fr. 9–12, 16, 19–20, 25–28) and his *Physics* (fr. 36–37, 43–44, 100–1).²² There is no evidence that any of this work ever circulated widely: all later citations come from philosophers, mostly Platonists in their teaching commentaries. This is probably why references to the zoological work of Eudemus are so scarce: those who had the best access to his works had little interest in biology, and few others had incentive to seek out his work.²³ Pliny, for example, cites Aristotle and Theophrastus often in his reports on animals but never Eudemus, not even in his vast list of sources; nor does Athenaeus mention him over a century later.²⁴ Evidently, few bothered to consult his work, and if specialists in zoology did, little of their work survives.

Apuleius, however, probably did read Eudemus. His writings indicate the breadth of his learning as well as his interest in Platonism. Two books *On Plato and His Doctrine* provide summaries of middle Platonist physics (including physiology) and ethics comparable to Alcinous' *Didascalus*; a third book (of uncertain origin) covers the

²¹ Dercyllides is cited by Theon of Smyrna, who postdates him but probably not by much; see Mansfeld p. 64. Plutarch shows awareness of many of Aristotle's treatises but direct knowledge of few; see Sandbach, but cf. n. 32 below.

²² Aspasius had probably used Eudemus' *Physics* already for his commentary on *Ar. Phys.*; see fr. 107, Barnes (1999) p. 10–11. For the availability of Eudemus' studies of early mathematics, see Tannery.

²³ The commentators virtually ignore the zoological works; cf. Simpl. *In Phys.* 3.5–10, Prisc. *Ad Chosr.* 42.6–7.

²⁴ All seven reports ascribed to Eudemus deal with behavior, mostly of mammals; but Ath., focused on dining, discusses only fish and fowl at any length. He also seems to have used Aristoph. *Epitome*, not Aristotle's own works; see De Stefani.

remaining field of logic; and an essay on Socrates' *daimonion* and a Latin version of the pseudo-Aristotelian *De mundo* cover theology, cosmology, and meteorology.²⁵ Reports about lost work show even wider range. Works on botany and medicine extend the biological studies described in his speech; and a Latin version of Nicomachus' *Arithmetic* and works on astronomy and musical theory reflect his Platonism but also parallel the studies of early mathematics and astronomy by Eudemus (fr. 133–49).²⁶ Apuleius, in short, had the background to know about Eudemus, ample opportunity to read his works, and multiple reasons to do so. Yet he had little to gain by inventing claims about someone then so little known. It is therefore reasonable to trust his claim that Eudemus wrote on animals.

Aelian is the only other source to ascribe any study of animals to Eudemus. Active a generation or so later (c. 170–c. 230), he too had excellent access to work from the early Lyceum. A native of Praeneste recognized for his mastery of Attic, he apparently spent most if not all his life among the intellectual elite in and around Rome. A lost work *On Providence* (fr. 9–10 Hercher) points to philosophical pretensions, and the aptly entitled *Variegated Report* (Ποικίλη ἱστορία) is packed with anecdotes about philosophers. His massive collection of animal lore may be most indebted to recent compendia.²⁷ But like his Greek contemporary Athenaeus, he frequently cites Aristotle and his colleagues. What if any of their work he knew directly is uncertain. But even if he relied solely on later sources, his references show that he knew much of their work at least indirectly. If we count explicit citations alone, his work on animals names Aristotle 50 times — more than anyone except Homer (62 times) — Theophrastus 17 times, and Aristoxenus, Callisthenes, Clearchus, Heracleides, and Hermippus once each. But he names his sources very sporadically, and much more that he leaves unattributed has parallels in extant works of Aristotle or in testimony for Theophrastus.²⁸ He may also have taken more than he acknowl-

²⁵ On these works, see Dillon p. 306–38; Harrison p. 136–209. His *De Interp.* is based mainly on Ar. *De Interp.* 1–7 and *APr* 1.1–8 but draws on Theophrastus and apparently also Eudemus; cf. fr. 92 FHS&G and fr. 91D = Eud. fr. 17a–c.

²⁶ On these and other lost works, see Harrison p. 14–38. Eudemus' work on astronomy is the likely source of an obscure report on Thales' astronomy in *Flor.* 18; cf. D.L. 1.24 (following Eud. fr. 144) on correlating solar and lunar cycles, White (forthcoming).

²⁷ See Scholfield p. xv–xxv for a summary of earlier *Quellenforschungen*.

²⁸ E.g., NA 5.4 from HA 6.12, NA 5.5 from HA 9.49.

edges from Eudemus. The frequency of these borrowings, along with Aelian's evident preference for older authorities, makes it unlikely that he refers to some other Eudemus. All seven citations occur in *NA* 3–5, where he relies mostly on early authorities, Aristotle and Theophrastus above all. Even his failure to identify Eudemus more fully favors Aristotle's colleague, since he tends to cite older sources by a single name and supply details only to distinguish homonyms or specify recent or obscure sources.²⁹

Like Apuleius, Aelian cites Eudemus for work on animals. But his own interests and methods may distort our picture of this work significantly. The title of Aelian's work transmitted in the manuscripts is not *On the Nature of Animals*, as custom now has it, but *On Distinctiveness in Animals* (Περὶ ζώων ιδιότητος). This reflects his two main aims, which he announces in a Prologue: to show that animals are not inferior to humans in "goodness and intelligence" (ἀρετὴ καὶ φρόνησις), and to illustrate their diverse talents (τὰ προσόντα ἰδίᾳ ἐκάστω).³⁰ He also rewrites and rearranges his material extensively. Following the archaizing fashion of his era, he adopts an Atticist style of mannered simplicity and elegant diction; and eschewing any systematic organization (alphabetic, geographic, taxonomic, or thematic), he emphasizes diversity by artful juxtaposition. The result, he explains in an Epilogue, is disorganized by design: "I mixed up my varied material variously" (ἀνέμιξα τὰ ποικίλα ποικίλως) to produce "a meadow or garland of many colors." Unfortunately, this tends to obscure the original interests of his sources.

Aelian shows no sign of any first-hand study of animals, and his sole claim to novelty is in arrangement and style. But if his work is entirely derivative, much of his material is sound; and though his immediate sources are rarely certain, his debt to Aristotle and Theophrastus, however indirect, is clear.³¹ His interest in diversity also led him to draw on other sources, and just as he took the trouble to consult specialists like

²⁹ For example, he uses "Aristophanes" for the dramatist but adds "of Byzantium" to specify the Alexandrian scholar (1.38, 7.39, 7.47); similarly to distinguish Hecataeus of Abdera (11.1) from the better known Milesian. Contrast the fuller references to the recent Leonidas of Byzantium (four of five times).

³⁰ See Hübner for detailed discussion.

³¹ Scholfield concludes that "he has shown judgment in choosing his authorities" (p. xxiv); this includes six of Theophrastus' zoological opuscula: fr. 355–56 (cf. 218B), 359B, 361, 362C, 363, and 365 app. FHS&G.

Alexander of Myndus on birds, Sostratus on reptiles, and Leonidas and Demostratus on fish, so he may have consulted Eudemus too. The length and detail of some of his excerpts (especially fr. 127) make an intermediate source unlikely, and no trace of any earlier excerpting of his work survives.³² But wherever Aelian found these reports, what is their likely origin?

A study of animals is clearly the likeliest source. Apuleius refers to such a work, and Aelian's collection, which is our earliest source for its contents, draws on very little else. Format and subject matter point the same way, since detailed reports of animal behavior are common only in zoological works.³³ In particular, all seven excerpts record evidence of intelligent behavior, such as we would expect to find in the work *On Intelligence and Character in Animals* (Περὶ ζῴων φρονήσεως καὶ ἥθους) listed in the catalogue of Theophrastus' works (D.L. 5.49).³⁴ This title is not otherwise attested, and some have argued that it refers to HA 9.³⁵ But it is much more likely to be the title of Eudemus' work.

³² Thus, Eudemus is not named in the extant portions of Aristoph. *Epitome*, even for animals he discussed; the two reports of his which appear in the late Byzantine *Sylloge* that contains the *Epitome* come from Aelian (2.164 = NA 3.21, 2.615 = NA 4.8); cf. Sharples (1995) p. 35–37; Kullmann. On the other hand, Plutarch may have drawn on Eudemus for his own dialogue on animal intelligence, Πότερα τῶν ζῴων φρονιμώτερα, τὰ χερσαῖα ἢ τὰ ἔνδρα (*De soll.*); cf. n. 53 below.

³³ Wehrli (1955, p. 112) considers and rejects two alternatives, a dialogue or collection of marvels, as unattested and incompatible with the scientific orientation of other testimony; cf. Wehrli (1968) col. 657. Moreover, no collection of animal “marvels” is securely attested before Callimachus in the mid-third century; see Giannini. The *Paradoxa* transmitted under the name of Antigonos of Carystus is almost certainly a Byzantine compilation from multiple sources, including Antigonos (*Paradox.* 10 = fr. 52B Dorandi, 18 = fr. 51B, 23 = fr. 54B, 126 = fr. 53B) but also Aristotle (*Paradox.* 27–115) and Callimachus (*Paradox.* 129–73); see Musso, Dorandi p. xiv–xvii. The *Mirabilia* preserved in Aristotle's corpus simply excerpts prior work, mainly Theophrastus and Timaeus supplemented by some later work; see Flashar (1972) p. 39–55. Works Περὶ τῶν μυθολογουμένων ζῴων (either *On Animals in Popular Lore* or *On Legendary Animals*) ascribed to Aristotle (D.L. 5.25 = Hesych. no. 95) and Strato (D.L. 5.59) probably sought to rebut popular misconceptions by providing naturalistic explanations, as Theophrastus evidently did in *On Animals said to be Grudging* (fr. 362A–I FHS&G; five of the ten cases cited also appear in HA, including one dismissed as “ἐπιμυθεύμενα fabricated by women and enchanters” in 8.24 605a2–7); cf. Huby p. 320–21; Sharples (1995) p. 72–73. Similarly, Strato's *On Puzzling Animals* (Περὶ τῶν ἀπορουμένων ζῴων) probably addressed problematic kinds; cf. Wehrli (1950) p. 67.

³⁴ Cf. Wehrli (1955) p. 112.

³⁵ Regenbogen col. 1432–44; cf. Sharples (1995) p. 45–48.

If a full list of his works was ever compiled, none survives.³⁶ Yet titles for most of his other works appear together with it in the same catalogue. That catalogue combines four distinct lists. The first two list all but one of Theophrastus' extant works, along with all other titles ascribed to him in extant testimony.³⁷ The other two are much shorter and probably supplementary, and they contain only three titles attested anywhere else: historical studies of geometry, arithmetic, and astronomy, which are almost certainly Eudemus' works (fr. 133–49), not similar but otherwise unattested works by Theophrastus.³⁸ Other titles in the supplements also point to Eudemus: six books of *Research on the Divine* probably refer to his study of Orphic and other cosmologies (fr. 150); *Terminology on Expression in Syllogisms* suits the extant testimony for his *On Expression* (fr. 25–29); *Preliminaries to Topics* could be its second book; and a book *On Causes*, two *On Motion*, and one *On Heaven* would parallel the structure of his four-book *Physics*.³⁹ If Eudemus did write *On Intelligence and Character in Animals*, that was probably the original home of Aelian's excerpts. Or if that is another's work, its title nonetheless encapsulates what all the surviving fragments emphasize, as a closer look will show.

2. Intelligent Behavior

Theophrastus devoted separate studies to several topics covered in *HA* 8 and 9.⁴⁰ Eudemus evidently did something similar for *HA* 9. Too little survives to tell whose work came first. But all of his reports focus on behavior, habitual in two cases (fr. 126, 130), incidental in the rest;

³⁶ Extant biographical and lexicographical works ignore him entirely; only philosophical works cite titles for his works, and they ignore zoological works almost entirely (cf. n. 23 above). But Simplicius quotes from a life by Damas (fr. 1, cf. *DPhA* 2 p. 540–41), and lives of writers normally included a list of their works.

³⁷ See White (2002).

³⁸ So Usener p. 17–18; Regenbogen col. 1365; Wehrli (1955) p. 114. The contents of the four lists suggest that the first two list books from the Lyceum, the latter two works found elsewhere; if the complete catalogue comes from Alexandria, the supplements may contain third-century acquisitions from Rhodes, as recounted in *Ath.* 3a–b; cf. Regenbogen col. 1377–78, Moraux (1973) p. 12–15.

³⁹ Simplicius reports (fr. 109), and many of his citations confirm, that Eudemus followed the sequence of topics in Aristotle's *Physics*; see Sharples in this volume. For the works on theology and logic, see Betegh and Fortenbaugh in this volume.

⁴⁰ Some of his works are probably excerpted in *HA* 8, others apparently supplement *HA*; see Huby, Sharples (1995) p. 32–41.

and all seven describe inventive responses to environmental opportunities or challenges. That is why Aelian recounts them, though it is unlikely that Eudemus shared his contrarian view that animals are often better and smarter than people.⁴¹ All seven reports involve basic problems of survival or reproduction. All but one center on large mammals (either viviparous quadrupeds or closely related “dualizers”), and most have close parallels in *HA* 9. One of the closest is a brief report about gulls (fr. 126) which Aelian recounts alongside another about pelicans from *HA* 9.10 (614b26–30). His chapter deserves to be quoted in full.

Pelicans on rivers scoop up shellfish [κόγχας], then swallow them; after heating them internally in the hollow of their stomach, they disgorge them; the shells open up from the heat as they do when cooked, and the pelicans dig out the meat and have a meal. So in fact gulls too, as Eudemus says, by taking snails [κοχλίας] high in the sky smash them very forcefully on the rocks. [*NA* 3.20]

Wehrli assigns only the second case to Eudemus. The other comes from a long section on birds (*HA* 9.7–36) full of evidence for their intelligence.⁴² But there are no reports about gulls there, and none of Aristotle’s four reports about them elsewhere (all in *HA*) describe them feeding this way. Eudemus may have recorded both cases, though the way Aelian links them (καὶ μέντοι καί) suggests that he or an intervening source was the first to connect the two.⁴³ More likely, Eudemus went beyond *HA* 9 and collected further evidence of intelligence in animals. Both cases involve shore-birds feeding on shellfish. But pelicans rely on their crop, whereas gulls, which have no crop (*HA* 2.17 508b33–509a5), select snails, whose thinner shells break more readily. In effect, gulls show greater ingenuity in exploiting their environment, whereas pelicans illustrate natural teleology in their anatomy. That is one reason why the pelican report was widely repeated, not only in natural histories (Pliny *NH* 10.131) and collections of “marvels” (both

⁴¹ The invidious comparison with people in fr. 130 is clearly Aelian’s addition; see n. 47 below.

⁴² *HA* 9.10 opens with a reference to intelligence in cranes: φρόνιμα δὲ πολλὰ καὶ περὶ τὰς γεράνους δοκεῖ συμβαίνειν (614b18), where καί points back to the ingenuity of woodpeckers described in the previous chapter.

⁴³ Probably either Pamphilus in the first century CE or Alexander of Myndus a century earlier; see Wellmann (1891, 1916). Aelian’s account of the pelicans, which omits details about the shellfish, describes the pelicans more vividly, and mistakes their crop for their gut, illustrates how much his versions can distort the originals.

ps.-Ar. *Mirabilia* 14 and ps.-Antig. *Paradoxa* 41, both in sequences of material from *HA* 9) but also in theological debates: Cicero includes it in the evidence cited by Stoics to support their cosmological arguments (*ND* 2.124; 2.125 = fr. 342 R gives Aristotle credit for most of the data).⁴⁴ This difference is easily overlooked, and Plutarch in his dialogue on intelligence in animals speaks of the “ingenuities” (σοφίσμασιν) of herons regurgitating oysters (*De soll.* 967C–D, cf. *Ael. NA* 5.35). By contrast, the gulls must manipulate multiple variables in selecting fragile shells, finding a suitably hard but level surface, flying high enough to crack the shells but low enough to spot where they fall, and finally extracting flesh from the broken shells.⁴⁵

Eudemus’ report about gulls is not recorded elsewhere. Athenaeus preserves a similar report about partridges on Sciathos eating snails (390c) without commenting on their intelligence.⁴⁶ Yet that was very likely the point of Eudemus’ report, even if he mentioned no other birds. It was clearly the focus of another report on feeding, and the only other on habitual behavior (fr. 130).

“There are irrational animals which possess a natural counting ability [φυσικὴν ἔχειν ἀριθμητικὴν] without being taught,” says Eudemus, and as witness he adduces that animal in Libya. He does not give its name, but what he does say is this: “whatever it captures, it makes into eleven portions, and it eats ten but leaves behind the eleventh. For whom, and in return for what, and with what idea is worth investigating”: a sort of first-fruit or tithe, one might say. Surely it is right to be amazed at this self-taught wisdom; for an irrational animal knows the unit and pair and the following numbers, whereas a human needs how many lessons and how many blows in order either to learn these things well, or often not to learn? [*NA* 4.53]

Inverted commas indicate indirect discourse, which Aelian uses when paraphrasing a source. The sentence in direct discourse at the end is

⁴⁴ Cicero refers to the *platelea* and Pliny to the *platea* in *NH* 10.115, apparently mistaking pelicans (which were rare in Italy) for spoonbills; see Thompson (1936) p. 232, cf. 193.

⁴⁵ Cf. Griffin p. 43–45, citing recent observations of herring gulls in Massachusetts and crows in Canada.

⁴⁶ This report probably comes from Theophrastus’ work on local variation: the specification of location suits that work, and Ath. recounts this case shortly after citing the work for partridge voices (390a = fr. 355B FHS&G, cf. *NA* 3.35 in fr. 355A) and right after citing Theophrastus again for the distinctive anatomy of partridges in Paphlagonia (fr. 356 FHS&G, cf. *Ael. NA* 10.35, 11.40).

clearly his, and the preceding mention of tithing probably is too.⁴⁷ Remove these accretions, however, and what remains is an ostensibly factual report about an exotic, hence nameless predator (cf. *HA* 9.33 on a nameless bird in Scythia). Its alleged habit of dividing its prey clearly suits a work on animal intelligence, especially one by a scholar of mathematics (cf. fr. 133–49). But did Eudemus really claim that animals can count? According to Aelian, he cited this case as evidence (ἐπάγει μαρτύριον) for a general claim about a “natural” ability in “irrational animals” (ἄλογα ζῷα). Aelian says nothing about how this ability is to be analyzed or explained. On the contrary, he leaves that an open question: both the animal’s intentions (ὅτῳ καὶ ἀντὶ τοῦ) and its “idea” (ἐννοίᾳ τίνι), he says, warrant further study (σκοπεῖν ἄξιον). Whether Eudemus raised these questions himself, and how he answered them, if he did, is unclear. If he proposed a simple explanation, such as the usual size of a litter or pack, Aelian or his source has omitted it, as he often does elsewhere.⁴⁸ In any event, there is no reason to attribute to Eudemus any appeal to the “self-taught wisdom” which Aelian goes on to mention in direct discourse.

Others shared Eudemus’ interest in the fauna of Libya, which was famous for its biodiversity (cf. *Hdt.* 4.191–92). Aristotle, quoting the proverb “Libya always bears new things” (cf. Anaxilas fr. 27 KA, in a contemporary comedy), observes that the region was home to the greatest variety of creatures, which he attributes to inter-breeding at watering sites and cites wolf-dogs as an example (*HA* 8.28 606b18–607a3, cf. *GA* 2.7 746b7–11). Pliny quotes the same proverb and reports hybrids of lions and leopards before naming Aristotle as his main source (*NH* 8.42–43). Either of these purported hybrids would suit the predator described by Eudemus and explain why it had no name. Theophrastus, in a work *On Differences according to Place* (fr. 355–58 FHS&G) which is a likely source for much of *HA* 8.26–28, discussed other examples of variation in Libya: mute frogs (fr. 355C, explained physiologically in fr. 355A: *NA* 3.37; cf. *HA* 8.28 606a6, *Mirab.* 68), blinding asps (fr. 355A: *NA* 3.33), and probably some long-horned

⁴⁷ The interjection ὥς ἄν εἴποις is typical of Aelian, and idiomatic ἢ πολλαῖς suits his hyper-Atticism; similar editorial comments close fr. 129, 131, 132.

⁴⁸ *HA* 6.20 reports dogs having up to a dozen in a litter, 6.35 the same for wolves, and 8.28 reports hybrid wolf-dogs in Libya, presumably the jackal or an unfamiliar kind of wild dog. For hunting in packs as evidence of intelligence (requiring cooperation and coordination), see Griffin p. 63–66.

sheep (*HA* 8.28 606a18–21, cf. *Hdt.* 4.29) and exotic rodents or “mice” (fr. 359B–C, cf. *HA* 8.28 606b5–9, *Mirab.* 28, *Hdt.* 4.192).⁴⁹ None of these cases provides any obvious evidence of intelligence. But another does exhibit a similarly “natural” awareness of astronomy: Lycus of Rhegium, a contemporary of Theophrastus, reported how Libyan sheep change the direction they face when sleeping after Sirius rises (fr. 13: ps.–*Antig. Parad.* 60, cf. *HA* 9.3 611a3–6).⁵⁰

Few of the reports of “mathematical” abilities in animals compiled by Aelian and others can be traced to the early Lyceum.⁵¹ But Aristotle was prepared to accept credible evidence. *HA* 8 opens with a general claim that many animals show “traces of psychic traits,” including “similarities to mental comprehension” (588a18–25). *HA* 9 opens with a similar claim that animals “clearly have some natural capacity [δύναμιν φυσικὴν] related to each of the affections in the soul,” including intelligence (φρόνησις), and that some are able to learn on their own or by training (608a13–21). Aristotle cautiously adds that some specifically mental traits are only “analogous” and differ in kind: “as craft, wisdom, and comprehension occur in humans, so there is in some animals some different but similar [ἐτέρα τοιαύτη] natural capacity” (588a28–31). Despite these reservations, *HA* 9 repeatedly describes animals as “intelligent” (φρόνιμα). His point is not that any animals possess the distinctly human virtue of practical wisdom. Rather, as he observes when analyzing that virtue, animals that exhibit a “capacity of foresight” (δύναμιν προνοητικὴν) in performing their vital functions (περὶ τὸν αὐτῶν βίον) are called “intelligent” in a looser sense (*NE* 6.7 = *EE* 5.7 1141a25–28).⁵² A discussion of dolphins near the end of *HA* 9 provides an instructive example. After alluding to famous tales of their friendliness, 9.48 recounts some “incredible” (ἄπιστα) claims about their speed, including reports of them leaping over the boom or

⁴⁹ See Sharples (1995) p. 55–57, 65–66; cf. Huby p. 322.

⁵⁰ Cf. *Plut. De soll.* 21 974F, *Pliny NH* 8.203. On Lycus, see n. 7 above.

⁵¹ A report of cattle in Susa counting to 100 (*Ael. NA* 7.1, *Plut. De soll.* 974D–E) is ascribed only to Ctesias (whom *HA* does not trust: 523a26, 606a8; cf. 501a25–b1), and Aelian’s counting ants and bees (*NA* 1.22, 5.13) do not appear in *HA* 9.38 or 9.43 on those insects. But *HA* 9.39 calls a kind of spider σοφώτατον for constructing its web geometrically (623a7–11; cf. *Ael. NA* 6.57–59), and *Ar. fr.* 342 (but not *HA* 9.10) says cranes fly in triangles. The question of numeracy or “numerosity” in animals is still a focus of research and debate; see Griffin p. 136–37 and the studies in Boysen and Capaldi.

⁵² See Labarrière (1990); Cole; Sorabji p. 12–16; Coles.

mast (ἰστούς can mean either) of boats. Yet Aristotle confirms this by first explaining how dolphins, after pursuing their prey to great depths, return to the surface so swiftly that they shoot high out of the water “like an arrow,” and then describing similar practices in human divers (631a22–32). The key to the dolphins’ diving is their ability to “hold their breath as if by calculation” (ὥσπερ ἀναλογισάμενοι). Dolphins, in short, seem able to count, though “as if” hedges the analogy.⁵³ If Eudemus handled the Libyan predator similarly, as Aelian’s open questions suggest, the basis of the “natural counting ability” in animals remained a problem for further study, not unlike the puzzle why (διαπορεύεται διὰ τί) some dolphins beach themselves “for no reason” (δι’ οὐδεμίαν αἰτίαν), which closes *HA* 9.48 (631b2–4).

The five other excerpts that Aelian ascribes to Eudemus each recount a single incident. This anecdotal format and the strange events described in some have led many to doubt that Eudemus of Rhodes is their source. But neither worry is compelling if Aelian’s handling of his material is taken into account. Aristotle relies heavily on oral informants and records many anecdotal reports.⁵⁴ Some of the strangest involve horses, which he calls the “lustiest” (λαγνίστατον) of all animals except humans (*HA* 6.22 575b30, cf. 6.18 572a8–12). Stallions, he reports in a lengthy account of their breeding, rarely breed beyond twenty years (6.22 576a26–b4; cf. 5.14 545a14–20), though he tells how one continued to sire for forty years thanks to its owners helping it mount (576b25–27).⁵⁵ He also observes that stallions mount “both their mothers and their daughters” (576a18–20). But he again reports an exception along with a similar story about camels in *HA* 9.47. In each, a colt that refuses to mount its mother is tricked into doing so, then reacts violently after discovering what it has done: the camel kills its handler, and the colt runs away and leaps off a cliff. Aristotle offers no explanation for either, though he elsewhere observes that males of both species are extremely aggressive in mating periods (*HA* 6.18 571b11–13, b23–25). Aelian recounts both stories without attribution and heavily embroidered. In his telling, the camel jumps off a cliff too, and Oedipus is criticized for only blinding himself (*NA* 3.47). His account of the

⁵³ Cf. Plut. *De soll.* 961E on ὥσπερ in similar contexts; see also Fortenbaugh (1971); Sihvola.

⁵⁴ See Manquat for the wide range of sources used in *HA*.

⁵⁵ Cf. 576b22 on breeding halters, 6.18 572a13–21 on Cretan techniques.

horse is twice as long (4.7), and it is followed by a similar anecdote from Eudemus (fr. 128).⁵⁶

Eudemus says that “a groom was aroused [ἐρασθῆναι] by a young mare, the best in the herd, as if, then, by a good looking girl more attractive than any in the area; and at first he controlled himself, but finally he ventured upon this alien marital bed and consorted with it. The mare had a colt, and it too was good looking; but when it saw what was being done, it was pained [ἀλγῆσαι], as if, then, for its mother being tyrannized by their master; and it jumped all over the man and killed him. Later, in fact, the colt watched where he was buried, went there, dug him up, and abused the corpse, and defiled a varied defilement, though it did not perceive the colt in pain [ἀλγοῦντα].” [NA 4.8]⁵⁷

Inverted commas indicate Aelian’s use of indirect discourse throughout, though he has clearly embellished the story, most obviously in likening the mare to a girl.⁵⁸ He is probably also the one who juxtaposed this and the case from *HA* 9.47, though as with fr. 126, the possibility that both come from Eudemus cannot be ruled out. The report may also be distorted. Aelian’s mention of a “marital bed” (λέχος) shows that he uses “consort” (ὁμιλεῖν) euphemistically here, as he often does. Eudemus may have been more explicit. But if the term is his, its meaning was probably innocuous. Aelian himself uses the verb in its primary sense for “handling” animals (*NA* 2.11); so does Aristotle, exclusively.⁵⁹ If Eudemus did so too, then the mare was mistreated (“tyrannized”) but

⁵⁶ *NA* 4.6 and 4.11 also repeat remarks on horse-breeding from *HA* 6.18; only the former names Aristotle. The horse story in *HA* 9.47 is retold in ps.-Antig. *Parad.* 54 (in a sequence from *HA* 9), Pliny *NH* 8.156; the camel story in ps.-Ar. *Mirab.* 2 (also in a sequence from *HA* 9).

⁵⁷ The full text was copied (with minor variants) in the Byzantine *Sylloge* (2.615) in a sequence taken from *NA*; Apostolius then copied the *Sylloge* in his collection of proverbs (9.10 = *CPG* 2 p. 464 omits the last two clauses and appends *Sylloge* 2.616 = *NA* 4.11).

⁵⁸ Diction again betrays Aelian’s hand: μεῖραξ and ὠρικός are from Attic comedy (here οὖν also indicates interpolation), λέχος is poetical, and the doublet λυμαίνεσθαι λύμην ποικίλην typifies his editorializing. His embellishment of *HA* 9.47 in *NA* 3.47 and 4.7 indicates how much his versions can add and distort.

⁵⁹ The aorist occurs 4 times in *NA* and the noun 19 times, always for mating; the present tense is used twice for other interactions, 3 times for cross-breeding, and 4 times for unspecified interactions between animals and people (here, 4.56 = fr. 131, 6.42, 7.19). Even if Aelian interpreted all four unspecified cases as bestiality, the original versions may have intended something else, such as fondling pets. Aristotle uses the noun both for sex and more loosely (mainly the former) but never the present tense for sex; see Bonitz, s.v.

not sexually assaulted, and the allegation of bestiality is simply an invention of Aelian's. In any case, the groom only provides the occasion for what the anecdote highlights, namely, the colt's violent reaction.

Aristotle singles out mares for their maternal behavior in *HA* 9.4, calling them "affectionate [φιλόστοργον] by nature," and reporting that if one dies after foaling, other mares in the herd nurse the foal (611a9–14). Only *HA* 9.47 and Eudemus describe offspring reciprocating. Neither ventures any explanation, and Aristotle hedges his report by introducing it as something "told" (λέγεται, 631a1) about an unnamed Scythian king (whose name Aelian claims to know). Aelian often omits such reservations, and he may have done so here. A simple explanation for both cases was readily available. *HA* 6.18 reports that healthy young mares like the one described here are very eager to mate when "in heat" (ὀργῶσιν, 572b5–7), and that stallions are so protective of mares in their harem that they drive other males away by chasing and biting them (572b9–16).⁶⁰ In short, both horses in Eudemus' report exhibit recognizably normal behavior. The moralizing tone is probably Aelian's, and the focus on revenge may be too. He also highlights the perspective of the groom, who is first "aroused," then "controls" himself until he "dares" to act. None of this figures in *HA* 9.47, and it would be rash to assume that it did in Eudemus. When Aelian ascribes motives once to the groom and once to the colt, his use of "as if, then" (ὥσπερ οὖν with genitives absolute) in each case suggests an interpolation. By contrast, his account of the horses says almost nothing about psychological states and is probably more faithful to Eudemus. The colt's behavior is closely observed: it sees, jumps, kills, watches, digs, and abuses. But the only feeling ascribed to it is a "pain" (ἄλγός) that drives it to protect the mare and trample the groom.⁶¹

What Eudemus used this anecdote to illustrate is hard to say. The colt's aggressive reaction could be filial and loyal or sexual and territorial. In either case, its attack on the corpse displays cunning persistence, though carried to bizarre extremes. But a similar anecdotal report seems to have little to do with intelligence (fr. 131).

⁶⁰ A similar explanation was available for his report about camels, since he knew that males are extremely hostile after mating (*HA* 6.18 571b23–25, cf. 5.2 540a13–18).

⁶¹ Unlike the more general term λύπη, ἄλγός refers to physiologically based pain, as in fever and hunger (*NE* 3.5 1113b26–30, cf. 1166b20) or anger (3.8 1117a6, cf. 1116b34).

Eudemus says that “a seal was aroused [ἐρασθῆναι] by a man who hunted for sponges, and emerging from the sea where a rocky cavern was, it would consort [ὁμιλεῖν] with him.” Now, then, this man was the ugliest of the divers but seemed most attractive to the seal; and no wonder, since people also are often aroused by the less good looking but feel nothing at all for the most attractive and disregard them. [NA 4.56]

The second sentence led Wehrli to suggest that Eudemus used this anecdote to illustrate the relativity of beauty. But the shift to direct discourse suggests that this editorializing is Aelian’s (inferential ἄρα also betrays his hand). Verbal parallels with fr. 128 suggest a rather different focus: both the initial attraction (ἐρασθῆναι) and its outcome (ὁμιλεῖν) are the same in both.⁶² It is tempting to conclude that Eudemus was duped by salacious informants: sponge-divers here (cf. HA 9.37 620b34) and horse-breeders there (cf. HA 6.22–25). But two points favor a more charitable assessment. First, neither term implies anything sexual. The reports on dolphins in HA 9.48 open with a passing reference to similar tales of their “loves and desires” (ἔρωτες καὶ ἐπιθυμίαι) for boys “near Tarentum, Caria, and other places” (631a911; cf. *Paradox.* 55). The first case alludes to the legend of Arion (cf. Hdt. 1.23–24), the second to a similar legend from Iasos (NA 6.15, Plut. *De soll.* 984E–F). Both seem to be local foundation legends, and neither involves anything sexual, only the famous friendliness of dolphins.⁶³ Likewise in fr. 131, Eudemus probably described the seal and diver playing in the water, not mating on land.⁶⁴ Second, even if his report was explicitly sexual, there was good reason to record it. Seals are one of the anomalous kinds that Aristotle labels “dualizers” (ἐπαμφοτερίζοντες), since they share morphology, habitat, and behavior with both fish and quadrupeds.⁶⁵ The female in particular is said to

⁶² But both ὁρασιότατος here and ὁρικωτέρας in fr. 128 occur in Aelian’s interpolations.

⁶³ Tarentum and Iasos each had a monument to the youth, and each stamped a dolphin-rider on its coinage. Another case from Naupactus was recorded by Theophrastus (fr. 568 FHS&G), and both he (fr. 567) and Clearchus (fr. 27) recounted a similar and clearly asexual tale of a boy and his pet goose (cf. Ael. NA 5.29); see Fortenbaugh (1984) p. 323–24. HA 9.48 cites similar stories of dolphins caring for their own young (631a11–20), and Aelian recounts several in NA (5.6, 8.3, 11.12, 12.6).

⁶⁴ So the progressive aspect of ὁμιλεῖν suggests; cf. n. 59 above.

⁶⁵ Paw-like flippers and tail-like feet (HA 2.1 498a31–b4, PA 4.13 697b1–7), marine feeding but terrestrial breeding and air-breathing (HA 6.12 566b27567a14); cf. Lloyd (1983) p. 44–53.

resemble women closely (567b13–14), genitals and mating behavior included (567b2–4, cf. 540a24–25). A report of one being attracted to a man who in turn looked like a seal, as Aelian suggests, would thus seem to provide credible and significant evidence of affinities in appearance, behavior, and sexual appetite.⁶⁶ It would also be fully in line with the program of *HA* 9 (as announced in the opening lines of 8.1, 9.1, 9.3, 9.7, 9.37, 9.44) and well suited to a work *On Intelligence and Character in Animals*. Similar interests are evident in a report on another dualizer (fr. 132).

In Egypt, a monkey, as Eudemus says, was being chased, and the chasers were cats [αἴλουροι]. Running away with all its might, it rushed straight up a tree. But they too leapt up swiftly; for they can grip the bark and climb trees too. But the monkey, as it was about to get caught, one by many, jumps out of the trunk and grabs the end of a branch hanging above it with its hands, and held on tight for no short time. The cats, since they could no longer reach it, ran away after other prey. It saved itself by great effort, owing itself a thank-offering. [NA 5.7]

The closing mention of animal sacrifice is clearly Aelian's (cf. NA 11.31), and some of the phrasing probably is too. But the basic report, though all in direct discourse, can be securely assigned to Eudemus. *HA* 9 never mentions primates, but material elsewhere in Aristotle indicates the significance of this report. *HA* 2.8, in a detailed account of primate morphology, highlights their "dualizing" affinities to both humans and quadrupeds.⁶⁷ One of the most striking traits they share with people is having articulated and prehensile "hands" (502b3–4), as no other quadruped does. This bears directly on a recurrent theme in Eudemus' reports. Aristotle, countering a claim by Anaxagoras, argues that humans have hands "because they are most intelligent" (διὰ τὸ φρονιμώτατον εἶναι, *PA* 4.10 687a7–12 = 59A102 DK).⁶⁸ Aristotle ignores primates in this context, but the implication is obvious. Apes must be exceptionally intelligent. However, three related factors limit their intelligence.

⁶⁶ Cf. *Od.* 4.443, where Menelaos wonders how Proteus could sleep beside stinking seals. The ps.-Ar. *Probl.* 10.52 asks why animals generally mate with their kind.

⁶⁷ Aristotle's "apes" (πίθηκοι) have no tails, his "monkeys" (κῆβροι) do (*HA* 502a17–18, cf. b21–25); the former thus include some monkeys (e.g., colobus) as well as the Pongids (apes, chimps, and gorillas). The flight of the πίθηκος in fr. 132 from cats suggests a fairly small animal like a colobus or chimp; the translation "monkey" thus reflects both its size and the imprecision of ancient nomenclature. This one may have lived among people, where cats were very common in Egypt (cf. *Hdt.* 2.66).

⁶⁸ See Coles p. 307–10.

To support his case against Anaxagoras, Aristotle relates human intelligence to our upright posture, unique among land animals, which frees our forelimbs to perform functions other than locomotion (687a4–7). Apes and monkeys, by contrast, are less able to use their hands for other purposes since they usually travel on all fours (*HA* 2.8 502b20–21).⁶⁹ This in turn Aristotle attributes to their top-heavy physique (502b14–21), which he calls “dwarfish” (νανώδης), and which he thinks impedes intelligence for physiological reasons (686a25–b31). Dwarfism thus prevents apes and monkeys from developing the intelligence which their hands would otherwise enable them to exploit. Finally, even the shape of their hands is “more brutish” (ἐπὶ τὸ θηριωδέστερον) than in humans (502b4). On all three counts, then, their “dualizing” illustrates affinities to both humans and other kinds.

The monkey in fr. 132 exploits its distinctive hands to evade predators. The gulls in fr. 126 and the Libyan beast in fr. 130 display similar ingenuity in handling prey. Hunting and evasion are basic means of survival, and reports of both provide abundant evidence of animal intelligence in *HA* 9. Both protective aggression and playfulness are also widely reported in *HA*, usually in connection with offspring or others of the same kind. Thus the colt in fr. 128 protects its mother, and the seal in fr. 131 consorts with someone whose appearance and behavior are said to resemble her own. What motivates this behavior is ill defined and unexplained. But two other reports from Eudemus provide a richer picture of animal psychology.

3. Behavioral Psychology

The five reports examined so far focus on behavior. Only two refer explicitly to motivational states: a colt’s “pain” and a seal’s “erotic” attraction. Similar states can easily be supplied for the others: fear in the monkey, hunger in the gulls and Libyan predators. But none are mentioned, at least not in Aelian’s retelling. The two remaining reports are much more detailed, and both refer to several psychological states. Both involve lions attacking and killing a bear. Both specify motives for the lions’ behavior, which is thereby portrayed as both intentional and intelligible: they attack in each case because the bear first kills fellow animals. Their reaction is in each case also called “just” or right. Aelian recounts fr. 127, the longest report of all, right after fr. 126 on gulls.

⁶⁹ Cf. *Pol.* 1.5 1254b27–32 on the ideology of free and servile postures.

Eudemus says that “on Mt. Pangaios in Thrace, a bear found a lion’s lair left unguarded and killed the lion’s cubs because they were still little and unable to defend themselves.” When the father and mother came back from hunting and saw their children in carnage, as likely, they were in pain and they went after the bear. Terrified, it ran up into a tree as its feet enabled it, and there it sat trying to evade their plot. As they seemed to come there to punish the defiler, the lioness kept guard there and sat by the trunk in ambush, looking up ferociously, while the lion, as if in anguish and despair over its grief like a human,⁷⁰ then roamed the hills. It came upon a woodchopper, who was terrified and dropped his axe. But the beast of a lion [τὸ δὲ θηρίον ὁ λέων] nuzzled him, then reared up and greeted him the best it could by licking his face with its tongue. The man regained some confidence, and the lion, wrapping its tail around him, tried to lead him away; but it did not let him leave the axe behind and signaled with its paw for him to pick it up. The man did not comprehend, so the lion took the axe in its mouth and gave it to him, then led him to its hut. When the lioness saw them, she too came forward, nuzzled the man, looked sad, and gazed up at the bear. Finally understanding, the man inferred that they had been wronged by it somehow, and with all the strength of his hands, he chopped down the tree. It fell over, the bear was brought down, and the beasts [οἱ θῆρες] tore it apart. But the lion led the man unhurt and uninjured back to the place it had found him, and left him to his previous woodchopping. [NA 3.21 = *Sylloge* 2.164]

Only the first sentence is indirect discourse, and Aelian has clearly embellished the rest at many points.⁷¹ But the basic report can be reliably assigned to Eudemus. Two others name a region (fr. 130 in Libya, fr. 132 in Egypt), and all may have originally. Here a more specific location adds credibility. Mt. Pangaios, north of Amphipolis, lies within the recognized range of lions in Europe (*HA* 6.31, 8.28, cf. *Hdt.* 7.126, *Xen. Cyn.* 11.1). It was also a major source of gold and timber for the Macedonian regime, hence also of woodsmen’s stories.⁷² Although parts of this story are surprising, the background scenario reconstructed by the woodsman is fully credible: lions tree a bear found near their dead cubs, then wait to kill it.⁷³ This looks like a normal protective response, and though it is futile here where the cubs are dead, *HA* 9

⁷⁰ Editors of Aelian bracket ὡς ἄνθρωπος; but *Sylloge* 2.164 preserves it and Wehrli retains it.

⁷¹ Atticisms include ἐν ταῖς φοναῖς, λυμεῶνα (cf. λυμαίνεσθαι λύμην in fr. 128), ἀλύων, ἡλᾶτο, ἐφαίδρυνεν. The sentimentalizing shift to “father and mother . . . children . . . hut” may also be Aelian’s.

⁷² Cf. reports of bison on Mt. Messapion in Paconia (northwest Macedonia) in *HA* 9.45.

⁷³ *HA* 6.18 reports that bears are very aggressive after breeding (571b30), presumably to protect their cubs; and *HA* 9.1 singles out bears for the females being more “spirited” and “brave” than males (608a33–35).

describes similar behavior in horses (9.4 611a12–14) and dolphins (9.48 631a15–20). Mention of a “plot” (ἐπιβουλὴν) by the lions may be Aelian’s but is also compatible with Aristotle’s usage in *HA*, where wolves (1.1 488b18), hyenas (8.5 594b2), and females generally (9.1 608a4) are described as “cunning” (ἐπιβουλα). More problematic are the lions’ interactions with the woodsman, especially the male’s attempt to communicate by “signalling” (ἐσήμαινε) with its paw and picking up the axe. Nuzzling, licking, pawing, and retrieving are familiar in dogs and other trained animals, but not in the wild or in predators like lions. But if Eudemus was gullible, he was not uncritical. The woodsman’s initial terror (ἔδεισε) and his failure to understand what the lion wanted (οὐ συνίει) underscore how surprising the encounter was. Yet the role of communication is carefully circumscribed. Not only do the lion’s “signals” fail; it is also described only as indicating an object or movement, not as signifying or expressing propositional content. Its gestures are thus comparable to two cases reported in *HA* 9: cranes cry out to “signal” the flock to take flight and to maintain formation (9.10 614b21–26), and bees both rouse and quiet the hive by buzzing “as if signalling” (9.40 627a24–28 with ὥσπερ). What is distinctive here is the lion’s signalling to another kind, and thus a predator’s attempt to elicit cooperation from a potential victim in the wild. Related factors loom large in the other report of a lion killing a bear, where both had previously been tamed (fr. 129).

Eudemus says that an account is amazing,⁷⁴ and this man’s account is this. A young hunter, able to live with the fiercest animals if they were trained from infancy, kept a dog, a bear, and a lion which he reared and fed together. “For a while,” Eudemus says, “they kept peace among themselves and were friendly to one another. But one day it happened that, when the dog was playing with the bear, nuzzling and bothering it, the bear went uncustomarily wild and attacked the dog, ripping open the wretch’s belly with its claws and tearing him apart.” The same man says that “the lion was upset at what happened, and as if hating the bear for breaking their pact and friendship and missing the dog as a companion, it reached a just anger and imposed a penalty on the bear, doing to it the very same things it had done to the dog.” Now Homer says, “how good it is for a son to survive when a man perishes.” Evidently nature indicates that there is profit, dear Homer, also in leaving behind a friend to avenge you, which is what we think about Zeno and Cleanthes, if there is anything to what we hear. [*NA* 4.45]

⁷⁴ Aelian’s syntax is awkward: φησιν governs an indirect statement (not a direct object as Schofield takes it).

The final two sentences are patently Aelian's, and Wehrli omits them. But interpolation is less apparent in the rest, which is mostly indirect discourse.⁷⁵ Ingenuity has little obvious role here. Two other factors are more prominent. One is psychological: the lion is "upset" (ἀγανακτῆσαι) at the dog's death, "hates" (μισῆσαι) the bear, "longs" (ποθῆσαι) for the dog, and exhibits "anger" (ὀργήν). Likewise in fr. 127, the lions feel "pain" (ἤλγουν), as does the colt in fr. 128; the male roams in "grief" (ἄχους) and its mate "looked sad" (ἑώρα οἰκτρὸν). This talk of feelings is in both reports accompanied by explicit ethical judgments: here the lion's anger is "just" (δικαίαν) and its reaction a "penalty" (δίκην); there the lions are "wronged" (ἡδικῆσθαι), as the mare in fr. 128 is implicitly (τυραννουμένης). How much of this comes from Eudemus is unclear. Some or all of it may be embroidery by Aelian or an intervening source. But two points suggest the cautious hand of Eudemus. First, none of his reports ascribe a sense of right and wrong to animals directly. The judgment in fr. 127 is explicitly marked as the woodsman's inference (συμβαλὼν), and the talk of justice in fr. 129 is limited to the observer's perspective. The lions, in short, are described as perceiving situations and events that involve right and wrong, and as responding in ways that are considered right. But in neither report are they described either as perceiving a situation as right or wrong, or as thinking or imagining that it is so. Second, both reports qualify the talk of feelings twice as "similar" or "likely": οἷα εἰκός and οἷα for the pain and grief in fr. 127; οἷονεῖ and οἷα for the hatred and longing in fr. 129. If these reservations go back to Eudemus, then it is still an open question what he meant to ascribe. In particular, did he use these terms literally to ascribe psychological attitudes, or only metaphorically to characterize behavior?

The case of the nameless Libyan carnivore (fr. 130) favors a literal sense. According to Aelian, Eudemus cited its habit of dividing its prey as evidence that at least some animals have a "natural counting ability." How he explained this ability, if he did, Aelian does not say. But the text does show that Eudemus was prepared to invoke natural capacities to explain behavior. At the most basic level, this is simply standard Aristotelian science, interpreting observed regularities as the normal operation of inherent capacities or powers. Here, as in much of ancient

⁷⁵ Aelian quotes *Od.* 3.196, which refers to Orestes and Telemachus avenging their fathers. Atticisms are few: ὑπαικάλλοντα (only in Aelian; simplex αἰκάλλω is poetic), perhaps ἐρεσχελοῦντα (cf. *NA* 3.37 from Theophr. fr. 355A FHS&G).

zoology, the regularities are behavioral and the explanatory powers psychological. Not only perception and desire but also imagination come into play: both expectation and intention are implied by the question “for whom and for what” (ὅτῳ καὶ ἀντὶ τοῦ) and the animal’s prospect or “idea” (ἐννοίᾳ). There is too little evidence to characterize the content of these states or their underlying capacities more precisely, and the phrasing may anyway be Aelian’s. But this much is clear. In his study of animal intelligence, Eudemus did more than collect evidence of behavior. At least in some cases, he also identified a psychological basis for it.

The two reports on lions confirm and enrich this picture. Similar capacities of imagination and desire are clearly operative in both. But here these capacities also give rise to feelings of pain, and this pain, besides playing a causal role in behavior, reflects underlying psychological dispositions and attitudes. In each case, pain is the pivotal link between perception and response, hence some sort of emotive or motivating factor. The lions in fr. 127 first “see” their dead cubs, then “feel pain” before they react; and the lion in fr. 129 attacks only after getting “upset” and “angry” at what it perceives. This pain in turn stems from a form of *philia* or care: parental and innate in one case, social and acquired in the other.⁷⁶ The former, perhaps because it is so widespread, is left largely implicit (the initial mention of “father and mother” and “children” may be Aelian’s). But fr. 129 highlights *philia* repeatedly. The three animals initially “kept peace” (εἰρήνην ἄγειν) and “had friendly thoughts” (φίλα νοεῖν) for one another. When the bear “goes wild” (ἐκθηριωθῆναι) and reverts to violence, the lion “hates” it for “violating their pact and friendship” (τὸ ἄσπονδον καὶ ἄφιλον), and it “longs” for the dog “like a companion” (οἷα ἐταῖρον). How Eudemus construed this friendship is not here explained. Presumably he did not view it as purely instinctive, since the animals involved are “the fiercest [ἀγριωτάτοις] of animals” and normally hostile. The talk of “peace” and a “pact” is merely behavioral, but “friendly thoughts” imply something more, most likely states of imagination and desire but probably

⁷⁶ Fr. 127 exhibits what Aristotle calls “kinship” (συγγενική, *NE* 8.12 1161b16–33, cf. *EE* 7.10 1242a1–4), fr. 129 the “companionship” (ἐταϊρική) fostered by sharing food and nurture (τὸ σύντροφον, *NE* 8.12 1161a30–1162a15). Both cases have implications for intelligence: fr. 129 because taming implies learning (cf. *HA* 9.1 608a17–21); fr. 127 because parenting is a sign of intelligence (*HA* 8.1 589a1–2, *GA* 3.2 753a11–14).

not articulate thought. The lion does not simply behave like a friend; it also has friendly feelings based on a friendly disposition. In short, it exhibits ἡθος or character.

Eudemus is not eccentric in ascribing friendship to animals. Aristotle often does so in both zoological and ethical works. Most of the phenomena he describes involve animals of the same kind or symbiotic relations based on need or risk. The proverbial “birds of a feather” (specifically daws) are cited in both ethical works as models of like being friendly to like (*NE* 8.1 1155a32–b8, *EE* 7.1 1235a6–13). Parental care, as a special case of this, is “natural” in most animals (*NE* 8.1 1155a16–19, cf. *EE* 7.8 1241a40–b4), and *HA* describes it in numerous kinds. But Aristotle rarely mentions any affection or feelings. Dolphins are unusually “caring for young” (φιλότεκνον, 6.12 566b23) and exhibit something “like pity” for dead young (οἷον κατελεοῦντες, 9.48 631a19). Mares, which look after orphaned foals, are “affectionate” (φιλόστοργον, 9.4 611a12), as are catfish (γλάνις) which protect their spawn (9.37 621a29).⁷⁷ Similarly, *Eudemian Ethics* 7.6 cites birds that “share birthing pain” (οἱ συνωδίνοντες) to illustrate how *philo*i share joys and sorrows (1240a35–36, cf. *NE* 9.4).⁷⁸ But reports of friendly feelings between different kinds are rare. *HA* 9 calls two animals “friendly to people” (φιλόανθρωπον): woodcocks in 9.26 and the “thos” or marten in 9.44. *Eudemian Ethics* 7.2, after restricting *philia* based on virtue to people, claims that *philia* based on pleasure or utility occurs even among wild animals (1236b5–10, cf. 1238a30–33); but the examples cited seem to be strictly utilitarian: the symbiosis of crocodiles and plovers recounted by Herodotus (2.68; cf. *HA* 9.6 612a20–24), and augural lore about different birds roosting together (cf. *HA* 9.1 608b27–29). Yet fr. 129 illustrates both friendship and friendly feelings between different kinds. It also illustrates the influence of habituation, which here suppresses innate tendencies to aggression and hostility.

In a survey of animal ἡθη or dispositions in *HA* 1.1, Aristotle calls lions “generous, brave, and well-born” (488b16–17). Whereas wolves are “fierce and cunning” (ἄγρια καὶ ἐπίβουλα) and serpents “selfish

⁷⁷ These are the only two mentions of φιλοστοργία (specifically parental care) in extant Aristotle.

⁷⁸ The term is rare; LSJ lists only three parallels: two from verse (Euripides and Nonnus), and Ael. *NA* 3.45 on pigeons, which derives from *HA* 9.7, where the male is said to bring food to its mate during incubation and “share her distress” (συναγανάκτησις, 612b34–35).

and cunning” (ἀνελεύθερα καὶ ἐπίβουλα), lions are brave and “generous” (ἐλευθέρια) because they are unselfish.⁷⁹ He also singles them out in *HA* 9.44 as “very playful and affectionate [στερκτικός] toward fellow feeders and familiars [τὰ σύντροφα καὶ συνήθη]” (629b11). Their “familiars” are usually other lions, especially cubs in the same litter. But fr. 129 ascribes the same relation to different kinds. Raised and fed together from infancy, the lion, dog, and bear are literally “fellow feeders and mess-mates” (συντροφούς τε καὶ συσσίτους), adopted siblings united by nurture and habit despite their antipathy in the wild.⁸⁰ Although this artificial bond is broken when the bear “goes wild” and the lion retaliates, it survives in the lion’s sympathy for the dog even after its death. The case thus illustrates how habituation can break down barriers even among “the fiercest of animals” that are normally hostile. It also illustrates Aristotle’s general rule that competition for food and habitat is the main source of hostility between kinds (*HA* 9.1, esp. 608b19–27). Here, as among the sacred crocodiles of Egypt (608b32–609a3), hostility ends when food is readily available. But if the lion’s feelings and dispositions are redirected by nurture, its aggressive nature persists. Its “character” can be shaped and moderated but not eliminated.

The lions’ *philia* is in both cases dispositional. It also has a psychological basis, since it gives rise to various feelings. It is thus a matter of character. Of course, it fails to meet Aristotle’s criteria for human *philia*, which involves a distinctly rational form of desire (βούλησις) which animals lack. But it is closely analogous, provided lions have the “spirited” desires of θυμός which Aristotle thinks many animals do. This inherent “capacity” (δύναμις), when developed into dispositional “states” (ἔξεις), is the motivating source of its behavior (πράξεις) and feelings (πάθη).⁸¹ But these dispositions and their characteristic expressions are “traits” (ἦθη) and “character” (ἦθος). Eudemus’ lions thus

⁷⁹ Schneider, followed by Becker and Peck, emends ἐλεύθερα to ἐλευθέρια, as the contrary of ἀνελεύθερα in the preceding line (neither word occurs elsewhere in Aristotle’s zoological works).

⁸⁰ *EE* 7 also cites *philia* in animals that live together (7.5 1239b19–20) or eat together (7.12 1245a12–13).

⁸¹ Cf. the correlation of capacities and states in *HA* 9.1 (608a13–17) and in Aristotle’s model of human psychology in *NE* 2.5 and *EE* 2.2. On spirited desire in animals, see Sihvola p. 122–31. Theophrastus also ascribed capacities of appetite and spirit (ἐπιθυμίαι and ὀργαί) to animals (fr. 271 and 531 FHS&G); cf. Fortenbaugh (1984) p. 274–85, Cole p. 52–62.

exhibit a kind of character *philia*, based on dispositions of spirited rather than rational desire. In both reports, their behavior results from the sudden and extreme frustration of these dispositional desires, and the consequent distress takes the form of pain, anger, and longing, as specified in each report. Viewed this way, their *philia* exemplifies the kind of “traces” and “similarities” of human traits and feelings Aristotle ascribes to animals in *HA* 8.1 (588a16–25). It thus illustrates the “continuity” he sees across the animal kingdom (588b4–12). Yet it also highlights important discontinuity, since it has a different psychological basis. Animal *philia* is only “analogous” to human *philia*, since it differs in kind, not merely in degree (588a25–b3). Lions and horses care more for their young and companions than most animals do, which is a difference of degree; but no animal has the rational capacities that set human care apart, and that is a difference of kind. Animal *philia* can therefore never be more than analogous to ours. Still, the analogy is more than behavioral. It is also psychological, based on related but fundamentally different forms of imagination and desire.⁸²

Eudemus’ two reports on lions also illustrate another sort of spirited disposition or character. Aristotle singles out lions not only as generous but also as brave (*HA* 1.1 488b16–17). Lions, of course, had long been a byword for bravery in folklore, which is presumably why they come first when he raises the topic of “bravery and cowardice in wild animals” in *HA* 9.44.⁸³ But his point is not simply that lions are aggressive or fearless predators. The evidence he collects supports a stronger and literal interpretation, that lions display a kind of virtue since their aggression usually follows norms of right and wrong. Some of their behavior shows only a lack of fear: a lion seen by hunters “never flees or cowers, and even if compelled by the number of hunters to back away, it retreats striding slowly and frequently glancing back” (629b12–15). But other observations go further: lions only attack people who attack them first (629b23–24); even then, if they are not wounded, they “do no wrong or harm” (ἀδικεῖ οὐδὲν οὐδὲ βλάπτει, b24–26); and the few which do “come near towns and wrong people” (ἀδικοῦσιν) are found (by their damaged teeth) to be too old to hunt successfully in the wild

⁸² It is thus *philia* in a “transferred” or “metaphorical” sense, based on an analogy within the same genus; cf. *Ar. Po.* 21 1457b6–33 and *Rhet.* 3.2 1405a10–37 on metaphors ἐκ τῶν συγγενῶν. Cf. Sihvola, who elaborates a similar “appearance-based view” of animal emotion in Aristotle.

⁸³ *HA* 9.44 vindicates observations in two Homeric similes (*Iliad* 11.554, 17.663).

(b27–33; cf. b8–10). Aristotle thus interprets their behavior as more than fearless aggression. Since they hunt only for food, attack people only in self-defense, and rarely harm them even then, their behavior follows recognized human norms of right and wrong. This disposition not to be aggressive in ways that people consider wrong is why Aristotle calls them brave. Nothing here implies that they either perceive or imagine anything as right or wrong *per se* or *de re*.⁸⁴ His account of the data requires only that whatever they do perceive, imagine, and desire leads them to behave in line with human norms. On this account, then, animal bravery is more than a behavioral trait. Its psychological basis makes it a form of ἦθος or character, and specifically a kind of virtue, since it adheres to standards of right and wrong.

Aristotle also discusses traits of this sort in the ethical works. *NE* 6.13 (*EE* 5.13) speaks of “natural states” (φυσικαὶ ἕξεις) of bravery, temperance, and justice found in animals and children despite their lack of intelligence (1144b3–17). No full analysis of these “natural” forms of virtue survives.⁸⁵ But the specific form exemplified by lions is discussed briefly. Courage is the first virtue analyzed in all three ethical works. Each contrasts it with five related forms of bravery based on different motives: experience, confidence, ignorance, honor or shame, and spirit or passion (*NE* 3.8, *EE* 3.1 1229a11–30a33, *MM* 1.20 1190b21–1191a21).⁸⁶ Both *NE* and *EE* call spirited bravery “most natural” (1117a4, 1229a28), and both ascribe it to animals as well (1116b25, b32, asses b36; 1230a22, boars 1229a25, cf. *MM* 1191a2–4). The similarity with courage is mainly behavioral: people and animals driven by these feelings tend to act in the face of danger as the courageous do. But the similarity is also psychological, and closely analogous whenever the correct behavior results. Defending children or offspring, for example,

⁸⁴ Cf. *HA* 9.1 609a32–36 on titmice tormenting asses that upset their nest διὰ τὴν βλάβην, where the point is only that loss of their young harms the birds, not that they perceive this as a harm or harmful. These reports are thus consistent with the claim in *Pol.* 1.2 1253a9–18 that animals “have perception of things painful and pleasant” but no concept of benefit or harm, right or wrong, good or bad; cf. Sorabji p. 30–40, 55–58.

⁸⁵ For the outlines of an account in *EE* 8.2, see White (1992).

⁸⁶ *NE* refers loosely to “other traits [ἕτεραι] said in five ways [τρόποις]” (1116a16–17); *EE* calls them “kinds said by similarity” (εἴδη λεγόμενα καθ’ ὁμοιότητα) and explains that they involve “enduring the same things but not for the same reasons” (1229a11–13). Questions of authorship aside, all three works indicate the kind of conceptions current.

is an act of courage only when done for virtuous motives, but it is still an act of bravery when motivated by spirited desires of care or anger. In humans, this spirited bravery is deficient because it is driven by “un-reasoning feeling” (διὰ πάθος ἀλόγιστον, 1229a21) and overlooks or disregards relevant risks and circumstances (1116b35). That is why it is called “ecstatic,” because it overwhelms our rational capacities and makes us act like wild animals (1229a25–27).⁸⁷ Similar behavior in animals, however, is natural since they have no reasoning capacity in the first place. In them as in children (1229a28–29, cf. *HA* 8.1 588a31–b3), a disposition of spirited desire to face danger in the right ways is a “natural” form of bravery.

The behavior of Eudemus’ lions is fully consistent with this model of animal character. Both reports depict reactions based on dispositions of care and bravery, mediated by feelings of pain and anger prompted by perceptions of harm and loss. His report about the mare and colt describes a very similar scenario, though in sparer terms. All three reports refer explicitly to feelings of pain, in each case evoked by the sight of harm to others, hence not merely bodily sensations but quasi-emotional states. These psychological states serve to explain the animals’ behavior and are in turn explained by predispositions or traits of character. None of the reports takes the further step of relating these states to physiological conditions, such as the inflammations in the heart that Aristotle associates with feelings of anger or the warm blood he associates with spirited dispositions in people and animals alike.⁸⁸ Nor do these reports ascribe any direct awareness of right and wrong to animals. Eudemus does describe them reacting to situations that many people, including his informants apparently and perhaps himself as well, consider harmful and wrong. But the animals’ reactions can be adequately explained by a simpler model of frustrated desire. Whether by instinct or habituation, the lions and colt desire the company of their fellows, and when the intervention of others prevents them from satisfying this desire, they feel pain and attack those responsible for their pain. What upsets them is in each case also a harm, perhaps even a wrong. But nothing in Eudemus’ reports implies that they have any awareness of harm or wrong *per se*, only painful feelings when their natural drives and dispositions are thwarted. On this model, then, ani-

⁸⁷ *NE* 3.8 quotes four Homeric phrases, including three cases of divinely inspired bravery (*Iliad* 5.470, 14.151, 16.529).

⁸⁸ See *PA* 2.2–4, Freudenthal p. 48–60, Coles p. 299–303.

mal traits and feelings are analogous to human traits and feelings because they depend on analogous perceptual impressions that represent the same situations in similar but distinct ways.

Eudemus' reports describe animals exercising a number of psychological capacities analogous to human ones. The "grief" of two lions at the death of their cubs, another's "anger" at the loss of its "friend," and a colt's "pain" at the abuse of its mother arise when basic drives are thwarted. A seal's attraction to a grizzly diver reflects a natural interest in playful or sexual interaction. The ingenuity of a monkey in evading predators and of gulls in extracting food from shells solves basic problems of survival. And in the most striking analogue, a Libyan carnivore divides its prey into portions. Together, these reports illustrate a wide range of intelligent behavior in a wide variety of animals and habitats. This diversity in turn is evidence of distinctive dispositions or characters in animals. Such meager remains afford little basis for assessing the scope or structure of the work which originally housed them. A systematic analysis of animal behavior would fill a major gap in the Aristotelian corpus. As Aristotle's studies of morphology and reproduction in *On Parts of Animals* and *On Generation of Animals* complement HA 2–4 and HA 5–6, so an analytical work *On Intelligence and Character in Animals* would complement HA 9. But such an ambitious study seems unlikely. Not only has it left very little trace. Fr. 130 on the Libyan predator leaves open the questions it raises about the psychological basis for the behavior it reports. On the other hand, the same report shows that Eudemus did more than simply collect information; he also marshalled this data as evidence that animals have distinct psychological capacities. His reports are also exemplary for his era. His reliance on informants notwithstanding, most are closely observed, and some show real discernment. Eudemus thus deserves to be ranked among the pioneers of ethology. Here as in physics and logic, his and Aristotle's paths converge. Both treat humans as the paradigm for interpreting animal behavior.⁸⁹ Aristotle offered no systematic analysis of the underlying affinities he assumes, and Eudemus may have done little or nothing more. But in the course of assembling data for further study, they helped frame the questions and set the parameters for a field that continues to incite vigorous research and debate.⁹⁰

⁸⁹ Cf. Lloyd (1983) 24–43.

⁹⁰ I am grateful to many at the Budapest conference for helpful discussion, and especially to Juha Sihvola for a helpful response.

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12

Eudemus and the History of Science

Jørgen Mejer

We know little of significance about the life of Eudemus of Rhodes; likelihood is that all biographical information about him was lost shortly after his death. A certain Damas is said to have written a biography of him (fr. 1W) but we do not know Damas' date or affiliations.¹ Apart from the anecdote about the succession of Aristotle (fr. 5W), the most important fact about Eudemus is that he in one way or another was concerned about the text of Aristotle's *Physics* and did some editorial work on it (fr. 1 — the continuation of the text, printed as fr. 98W, is important, 3–4, 5 and 124).²

In the history of philosophy and scholarship, Eudemus is first and foremost known for having “compiled histories of arithmetic and geometry, astronomy, and theology.”³ This impression is confirmed

¹ That this Damas, not otherwise known, was a pupil of Eudemus is pure speculation even if it seems quite possible (cf. Zeller 1879, 86).

² Eudemus may have left Athens for Rhodes even before the death of Aristotle (fr. 3W). His activity on Rhodes may have been important not only for philosophical activities in the Hellenistic period but also for the transmission of Aristotle's works, cf. Mejer 1998, 27. It is uncertain what, if anything, the *Ethica Eudemica* has to do with Eudemus, s. Wehrli 1969, ad fr. 151; Düring 1966, 444; and Flashar 1983, 242–43.

³ R. Sharples in *OCD*³ s.v. Eudemus 565. — When two of the great modern historians of science, Otto Neugebauer and Raymond Clare Archibald published a journal

when in Wehrli's edition of the fragments of Eudemus we find a section entitled "Geschichte der Wissenschaften" (fr. 133–50), based on references to Eudemus' works in authors from late antiquity. We must look at the exact references before we can discuss the nature of the works from which these fragments are taken:

- 134 (Proclus): Εὐδημος δὲ ἐν ταῖς γεωμετρικαῖς ἱστορίαις.
 139 (Eutocius): τοὺς τε τὴν Εὐδήμου γεωμετρικὴν ἱστορίαν ἐπεσκεμμένους.
 140 (Simplicius): ὁ Εὐδημος ἐν τῇ Γεωμετρικῇ ἱστορίᾳ.
 142 (Porphyry): Εὐδημος ἐν τῷ πρώτῳ τῆς Ἀριθμητικῆς ἱστορίας.
 143 (Clemens Alexandrinus): Εὐδημος ἐν ταῖς ἀστρολογικαῖς ἱστορίαις.
 144 (Diogenes Laertius): Εὐδημος ἐν τῇ περὶ τῶν ἀστρολογουμένων ἱστορίᾳ.
 145 (Theo Smyrnaeus): Εὐδημος ἱστορεῖ ἐν ταῖς Ἀστρολογίαις.
 148 (Simplicius): Εὐδημος τε ἐν τῷ δευτέρῳ τῆς ἀστρολογικῆς ἱστορίας.

Are the different versions of the titles in these references sufficient to establish that the title of Eudemus' works were Γεωμετρικὴ ἱστορία, Ἀριθμητικὴ ἱστορία, Ἀστρολογικὴ ἱστορία, and not Γεωμετρικαὶ ἱστορίαι, etc.? If the latter is the case, the meaning 'history' is less likely than 'research'.⁴

So, even if we accept that Eudemus did write works with the word ἱστορία in the title, we cannot be sure that these titles imply historical works. Aristotle and Theophrastus also wrote books with this term in the title but few scholars have claimed that their works were historical works in the sense that they assume Eudemus' works to have been historical: Aristotle's *Περὶ ζώων ἱστορία*⁵ and Theophrastus' *Περὶ*

devoted to the history of mathematics and astronomy they called it *Eudemus* (Copenhagen 1941); cf. Sarton 1970, 505 n. 18.

⁴ One more supposed historical work, sc. a history of theology presents a different problem: fr. 150W gives no title but just refers to Eudemus. There is little doubt that Eudemus did give a review of various theological speculations but already Wehrli pointed out that the context of this review is unknown and that similar accounts of mythical cosmogonies are also found in Aristotle's *Metaphysics* (983b1 ff.) and *De philosophia* (fr. 6 Rose/Ross). The expression κατὰ τὴν Εὐδήμου ἱστορίαν certainly does not refer to the title of a work by Eudemus. Fr. 150W is generally phrased in the style of the author who refers to Eudemus, Damascius, and many sentences cannot be attributed to Eudemus. On this fragment, cf. Betegh's paper in this volume. However, since we do not know the title of the book from which the fragments comes, it need not be relevant for determining the meaning of ἱστορία.

⁵ For the title, cf. Louis 1964, XVIII–XX.

φυσικῶν ἱστοριῶν⁶ are systematical examinations of animal/plant material found all over the Mediterranean world; they had many informants, but nobody had worked so extensively on these topics prior to Aristotle and Theophrastus so it is simply impossible that the term used for these lectures/books implied any kind of historical survey.

The meaning of Theophrastus' title 251 no. 1 FHS&G Τῶν περὶ τὸ θεῖον ἱστορίας cannot be determined, but there are no signs that it was a historical work. In the catalogue of Theophrastus' works, there are also three titles that sometimes are assumed to be identical with Eudemus' three ἱστορίαι:

137 no. 43 FHS&G Ἀστρολογικῆς ἱστορίας, α, β, γ, δ, ε, ς

264 no. 2 FHS&G Ἀριθμητικῶν ἱστοριῶν περὶ αὐξήσεως

264 no. 3 FHS&G Ἱστορικῶν γεωμετρικῶν α, β, γ, δ

The editors of FHS&G do not hesitate to translate ἱστορία in these titles with 'Research', and if the second title is correct there is no room for any other interpretation; this must have meant mathematical research on the increase (of numbers, size and volume). The meaning 'research' is also the choice of the editors for 727 no. 8 FHS&G Περὶ ἱστορίας. Finally, 727 no. 7 FHS&G Ἱστορικὰ ὑπομνήματα is given as the title of a work from which the only fragment deals with volcanos, hence translated *Research Memoranda*, see 196A FHS&G.

While most appearances of this word in Aristotle occur in connection with references to his Περὶ ζώων ἱστορία, there remain a few instances where ἱστορία/ἱστορικός may seem to have the meaning 'history/historian', most importantly in *Poetics* 9 1451a36–1451b32.⁷ It is, however, important to observe that here as in all the other passages, the reason why Aristotle uses the word is that he wants to point out that the subject of ἱστορία/ἱστορικός is the individual facts of the world, whether from a historical or contemporary perspective.⁸ This is why he

⁶ Some of the manuscripts of the list of books in Diogenes Laertius 5.46 give the title as being φυσικῶν but ancient references to Theophrastus' work confirm that the proper title is as given in the text. On the meaning of this title, cf. Amigues 1988, XVI–XVIII.

⁷ Louis 1955, 39–44 lists all the instances.

⁸ The expression ἱστορία τις in 1451b3 should not be overlooked: to translate it 'a kind of history' is to beg the question. Aristotle means that Herodotus in verse would be no less a ἱστορία than without verse, i.e. it would still deal with particular incidents that are not necessarily part of a single πράξις, as poetry should do, cf. 1459a21–29.

brings in iambic poetry, which does not address “the probable or the necessary,” but a particular individual; for Aristotle both some of the early epics and iambic poetry are more ‘historical’ and hence less poetic than tragedy and comedy. But even if ἱστορία/ἱστορικός do mean ‘history/historian’ in these passages they are clearly exceptions and thus give us no decisive help in determining the meaning of the titles of Eudemus’ works.

If we assume that Eudemus wrote his works early in the third century BC, we get little help from the titles of contemporary books determining the meaning of ἱστορία.⁹ The Peripatetic Praxiphanes did write a book called Περὶ ἱστορίας (fr. 18W) in the first half of the third century, but the meaning is as uncertain as it is in the case of Theophrastus’ book with the same title. Hieronymus of Rhodes wrote Ἱστορικὰ ὑπομνήματα (frr. 35–36W); the content of the two fragments deals with the sexual preferences of Sophocles and Euripides, and nothing indicates that this work was ‘historical’; on the other hand, it is not certain that the meaning of the title is *Research Memoranda*.

There are some signs that ἱστορία in this period could have the meaning ‘history’. The earliest indisputable instances of the meaning ‘history’ are a) Ephorus’ universal history, which seems to have been entitled Ἱστορίαι, from around the middle of the fourth century BC, and b) a letter from Lysimachus to the citizens of Samos from ca. 280 BC (*Orientalis Graeci Inscriptiones Selectae* no. 13) reporting that the people of Priene have referred to “ἱστορίαι, and other evidence and documents” in order to prove that a disputed piece of land belonged to them.

Considering the ancient evidence, it seems impossible to determine the nature of Eudemus’ works from their titles alone. Nevertheless there is a long scholarly tradition which assumes that the term ἱστορία when used by Eudemus implies ‘historical works’ and not just ‘Research’, as in the case of Theophrastus’ works. Before we go on to look at the actual fragments, a few quotations from various books on the history of philosophy may be illustrative.

In the standard edition of Eudemus’ fragments before Wehrli, L. Spengel (1870), the relevant section is introduced by the following remarks (p. IX):

⁹ Cf. Hornblower 1987, 7–12; Keuck 1934 is much more about the Medieval period and the Romance languages than about Classical Antiquity, cf. also Muller 1926.

Maiores momenti erant libri quibus historiam astrologiae, geometriae, arithmeticae enarravit; astrologicis usus est Simplicius in commentariis de coelo (fr. XCIV–VIIIseqq.), arithmetici Porphyrius ad Ptolemaeum (fr. LXXVIII), geometricis Proclus ad Euclidem (fr. LXXXIV–XCIII) qui primo loco quo geometriae disciplinam ab Aegyptiis ortam usque ad Philippum Platonis discipulum paucis comprehendit, Eudemi nomen non affert, sed verbis οἱ μὲν οὖν τὰς ἱστορίας ἀναγράψαντες μέχρι τούτου προάγουσι τὴν τῆς ἐπιστήμης ταύτης τελείωσιν ita iudicat ut nemo dubitare possit, qui utinam nusquam ubi Eudemum sequitur, eius nomen neglexisset! equidem enim quae apud Proclum de vetustis Geometriae studiosis philosophis inveniuntur, pleraque omnia ex his Eudemi libris sumpta esse censeo; sic de Euclidis theoremate I.23 p. 87 (fr. XC) dicit . . . at idem p. 81 multis problema explicans addit . . . , haud dubie ex eodem Eudemo descriptum. . . .

It is, however, wrong to assume that the emphasis on Eudemus' contributions to the history of science is due just to the Romantic movement and to Hegel. In the first modern history of philosophy, i.e. Jacob Brucker (1746), Eudemus is presented as follows (p. 856):

Eudemus Rhodum patriam habuit, Aristotelem praëptorem, ad quem is ethica scripsit, licet sint, qui ad Eudemum auctorem referant. Scripsisse enim ad imitationem magistri philosophica testatur Ammonius, notatque Boethius, auxisse eum logicam Aristotelis syllogismo hypothetico, et quinque aliis modis primæ figuræ, et septimo tertiæ. Desideratur etiam non sine jactura historiæ philosophicæ, ejus historia geometrica & astrologica veteribus passim memorata.

While Brucker mentions some of Eudemus' contributions to logic, it is obvious that he regrets the loss of what he considers Eudemus' historical surveys.¹⁰ This regret goes back to at least Johannes Jonsius whose *De Scriptoribus Historiae Philosophicae* is referred to in the standard edition of Diogenes Laertius, author of the only surviving specimen of ancient history of philosophy.¹¹

¹⁰ Cf. Fabricius 1793, 492–93: *Eudemus. . . Scripsit et Historiam Geometricam et Astrologicam, quae scripta cum magno rei literariae detrimento interciderunt. E geometrica adferuntur quaedam praeclara a Proclo ad I. Euclidis, Simplicio in I. physic. p. 13b. Ex astrologica a Laetio, Clemente Alex., Theone Smyrnaeo, Simplicio ad Aristotelem de coelo, et ab Anatolio in fragmentis, hoc capite a me editis.*

¹¹ Aegidius Menagius (Meibom 1692) ad D.L. 1.9: *Fuit Eudemus Rhodius Theophrasti aemulus, auditor & discipulus Aristotelis. De eo videndus omnino Johannes Jonsius de Scriptoribus Historiae Philosophicae lib. I cap. 15.* The first edition of Jonsius was published in Frankfurt in 1659, but I quote from Jonsius 1714, 92.

Eadem ætate florebat alter ille Theophrasti æmulus Eudemus, Rhodesius, auditor & discipulus Aristotelis, juxta Simplicium ad lib. I. comment. 12. adeoque inter incertæ ætatis scriptores, ut Cl. Vossio placet, lib. III. de Hist. Gr. minime reponendus. Æmulatione condiscipuli Theophrasti, cui & Laertius lib. V. tricuit [*lege* tribuit], Eudemus his scripsit, juxta Laertium lib. I. Thal. vel, juxta Clementem, lib. I. Strom. quo opere Astrologorum vitas & inventa, ipsiusque Astrologiæ ortum & progressum tradidit. Inde sunt, quæ de Thalete habent Laertius & Clemens, locis citatis, quod primus astrologiæ secreta sit rimatus, & eclipsin futuram prædixerit. Ejusdem meminit & Simplicius ad lib. II de cælo comment. 46. Propter hunc librum inter scriptores historiæ philosophicæ recensetur, cum historia astrologica pars sit historiæ philosophicæ, sicut astrologia est philosophia quædam Theoretica.

It is obvious that scholars very much have wanted to find ancient authoritative sources for the history of science and were convinced of the historical nature of Eudemus' works when they found references to Eudemus in Diogenes and late commentators. But it is also evident that that there has been no discussion of the meaning of ἱστορία or of the evidence for a change of meaning of the word ἱστορία from Theophrastus to Eudemus.¹²

If we now turn to the fragments presented in Wehrli's collection of Eudemus' fragments in a section called "Geschichte der Wissenschaften" (fr. 133–50), it is evident that fr. 133 is crucial for the possibility of determining the nature of Eudemus' books. This fragment comes from the introduction to Proclus' commentary on Euclid's *Elements* Book 1 (p. 64.16–68.6 Friedlein). Wehrli offers little in the way of proof that this fragment, in which Eudemus is not even mentioned, comes from Eudemus:¹³

Es wird allgemein mit Recht angenommen, dass das Material dieses historischen Abrisses grossenteils von E. stamme. Abgesehen von der Kürzung ist mit sachlichen Änderungen und Zutaten des Proclus oder seiner unmittelbaren Gewährsmänner zu rechnen . . . Neben E.s Γεωμετρικὴ ἱστορία scheint

¹² Two more specimens from the major handbooks on the history of philosophy: Brandis 1835, 30: Sehr gründlich und zuverlässig scheinen Eudemus des Rhodiers, eines der anhänglichsten Schüler dees Aristoteles, Bücher über die Geschichte der Astronomie (ἡ περὶ τῶν ἀστρολογουμένων ἱστορία, D.L. 1.23; ἀστρολογικαὶ ἱστορίαι Clem. Alex. Strom. I p. 130), Arithmetik und Geometrie gewesen und aus ihnen fast alle bedeutenen Nachrichten entlehnt zu sein, die sich über die Anfänge der mathematischen Wissenschaften erhalten zu haben. In Zeller 1879, 870 the three ἱστορίαι are said to be devoted to the history of sciences.

¹³ Spengel included also this passage in his collection of fragments and was possibly the first to do so. I have not seen Fritzschius 1851.

auch seine Ἀριθμητικὴ ἱστορία benutzt zu sein, weil der Abriss beide Disziplinen berücksichtigt und ausser den Aegyptern mit ihrer geometrischen Betätigung der Phoeniker als Wegbereiter der Mathematik gedenkt. Der formelle Unterschied unserer Liste von den Vorlagen, dass jene nicht nach Namen, sondern problemgeschichtlich geordnet waren (zu fr. 133–50), ergab sich mehr oder weniger zwangsläufig durch die Kürzung. Gesichert ist die Zuweisung dort, wo Übereinstimmung mit ausdrücklichen Fragmenten vorliegen. Dies gilt für den Grundgedanken, dass die empirischen Kenntnisse des Orients erst durch die Griechen zur Wissenschaft erhoben wurden und noch Thales als ihr Vermittler teilweise in der Empirie befangen blieb: Einzelbeispiele für diese Entwicklung geben fr. 134 und 135. Zur Bestätigung kommt hinzu, dass das Schema, nach welchem die kulturelle Entwicklung von αἴσθησις über λογισμός zu νοῦς führt (fr. 133), auf allgemeinen (platonisch-)peripatetischen Grundlagen ruht, cf. Aristoteles Metaphysik 981a12ff. und NE 1139a17ff.¹⁴

The many qualifiers in the first paragraph should be reason enough to hesitate to accept the ascription of fr. 133 to Eudemus. It is, however, the second paragraph that gives the game away. Needless to say, it is an Aristotelian idea that ideas from the Near Orient were taken over by the Greeks and turned into science — though this idea is also mentioned by numerous ancient writers with no Peripatetic connections. But there is little reason to take Thales as a mediator between empirical and scientific method, see below. Of the two references to Aristotle only the first is relevant, but here Aristotle talks about the relationship between experience and art (or knowledge), and this is not quite the same as the development described in Proclus (which looks rather Neoplatonic to me). In any case, in the section preceding fr. 133 it is certainly Proclus himself who refers to Aristotle, and the statement that mathematics originated in Egypt because of the annual inundations, differs from Aristotle, as Wehrli also notes, and it seems remarkable that Eudemus takes up an un-Aristotelian position without any further remarks.

Though Wehrli refers to Thomas Heath's discussion of Proclus' survey of the history of mathematics,¹⁵ he does not indicate why he decides not to follow Heath when the latter points out that the whole historical survey (pp. 64–70 Friedlein) seems to be of one and the same origin but that it goes beyond Eudemus in terms of chronology and hence must

¹⁴ Wehrli 1968, 114.

¹⁵ Cf. Heath 1921, 118–21, and id. 1926, 1:35–38. — Another possible source for information about the early development of mathematics is Geminus' work(s) (1st century BC), though, of course, it could be postulated that Geminus got his information from Eudemus. [Fragments in Tannery 1887, 18ff.].

come from an intermediate source. In fact, Proclus refers to Porphyry, to Eratosthenes and to some Platonists in this context,¹⁶ and the tenor of the whole survey is clearly written from a point of view that leads up to Euclid's *Elements* and to Platonic mathematics. Only in that sense is fr. 133 a historical survey of the development of geometry.¹⁷ That Eudemus in other fragments points out that somebody was 'the first' to find or say something does not prove that he wrote works on the history of Geometry, Mathematics, or Astronomy: similar expressions occur often in Aristotle and Theophrastus.¹⁸

The only other Eudemus fragment in which we find a historical sequence is fr. 145W,¹⁹ a list of Presocratic philosophers who were the first to observe various astronomical phenomena, though it is worth noticing that the list begins with Oinopides (who is later than the Milesians) and then goes on to Thales, Anaximander, Anaximenes "and the rest who made other discoveries on the basis of the previous discoveries." The source and the nature of this fragment is complicated (Theophrastus quotes Eudemus from Dercylides' introduction to Plato's philosophy), but if the text of the excerpt is reliable, Eudemus seems neither to have been a careful nor a knowledgeable writer of history.²⁰ It is, indeed, unwarranted to assume that all information about the early

¹⁶ If not before, then it has been clear since Burkert (1972, 409–12) that the statement "Pythagoras changed [geometry's] philosophy into a form of liberal education, seeking its first principles from a higher source, and hunting out its laws by a nonmaterialistic and intellectual procedure" does not go back to Eudemus, but is based on Iamblichus *De communi mathematica scientia* p. 70.1ff. Festa. In fr. 148 (on astronomy) Simplicius says that his information comes from "Eudemus . . . and from Sosigenes, who had borrowed this from Eudemus," yet another indication of an intermediate source.

¹⁷ It also seems unlikely that Eudemus should have referred to the Platonic dialogue *Amatores* for his information on Anaxagoras and Oinopides, p. 66.3–4 Friedlein. It is not possible to use the expression οἱ τὰς ἱστορίας ἀναγράψαντες μέχρι τούτου προάγουσι τὴν τῆς ἐπιστήμης ταύτης τελείωσιν p. 68.4 Friedlein to demonstrate that Eudemus' work was historical because to do so presupposes already that this survey comes from Eudemus. In any case, it seems rather unlikely that Eudemus should have considered Plato the culmination of mathematical development.

¹⁸ A similarly sceptical view of Eudemus as the author of Fr. 133 and a demonstration of its Neoplatonic characteristics is proposed by Eggers Lan 1985. For a very different view of this fragment, see Zhmud in this volume. – A still useful starting point for discussing the sources for Eudemus' works on science is Tannery 1882, 70–76.

¹⁹ On frs. 143–49, see Wehrli p. 149.

²⁰ For an attempt to give a historical interpretation of fr. 145, see Szabó & Maula 1982, especially 118–22.

history of geometry, mathematics, and astronomy goes back to Eudemus. When so many sources have been lost, it is always dangerous to subscribe to a one-source theory. Who would have thought that the story about the golden cup that went around from one of the Seven Wise Men to the next, was told by the scientist Eudoxus (D.L. 1.29 = DK 11A1 = Eudoxus fr. 371 Lasserre) and not an invention by an imaginative biographer?

If we reject the authenticity of fr. 133, we are left with a number of individual pieces of information concerning various important ideas about geometrical, mathematical, or astronomical problems that do not necessarily add up to historical accounts of these topics. So the next question to ask is why Eudemus should want to write 'histories of science'? Wehrli in his commentary says: "fr. 133–50 gehören neben Theophrasts *Φυσικῶν δόξαι* und Menons *Geschichte der Medizin* als Verwirklichung des aristotelischen Plans, die bisherige Entwicklung der menschlichen Erkenntnis für die eigene Forschung fruchtbar zu machen."²¹ Even though several scholars have pointed out that Aristotle had no intention of writing 'history of philosophy' etc., the further consequences of this view have not been followed up. Aristotle's surveys of earlier scholarship, which can be found in several of his works, are always meant as a way to find more definitive and irrefutable views of the world, as Aristotle understands it. His 'historical' ('doxographical' is probably a more correct term) surveys are always part of his systematic and dialectical treatment of a particular problem.²² But once the methodological nature of Aristotle's surveys of his predecessors is understood, the whole idea of a Peripatetic enterprise of *historical* research as such is without foundation.²³ Add to this that it seems likely that the correct title of Theophrastus' so-called doxographical work was *Φυσικαὶ δόξαι*, not *Φυσικῶν δόξαι*, and that several of the fragments assigned to Theophrastus' work in Diels' *Doxographi Graeci* seem more likely to come from his *Φυσικά*. In the

²¹ Wehrli 1968, 113. Wehrli refers inter alia to Jaeger (1948, 334–36), the locus classicus on the historical efforts of the Peripatetic school.

²² Cf. Mansfeld 1990b, esp. 3193–3205; H. Baltussen 1993, Chapter 2.

²³ There is no denying that Aristotle had a far more positive view of the intellectual development of mankind than Plato: according to Aristotle we can learn from history but the views of his predecessors are always brought up as attempts to solve particular problems and not as part of intellectual history as such. Compare *Topics* 2.2 & 13 with e.g., *Met.* 1 993a31–b19 and fr. 833 Gigon = 53 Rose.

end, there is little reason to assume that Eudemus' ἱστορίαι were historical in our sense of the word, the more so when we realize that historical information was also found in Eudemus' *Physics* (e.g., frs. 31, 43, 60, 65, 89), as it was in Aristotle's *Physics*.

It might occur to someone to object that we do have one specimen of a historical survey that could be part of a Peripatetic plan to map out all previous scholarship, viz. Menon's 'History of Medicine' to which Wehrli also referred. We may here omit discussion of the complete text as we find it in the papyrus: Anonymus Londinensis was undoubtedly a student of medicine whose purpose in copying out the text(s) was to learn as much as possible about medicine, as we see from his own critical remarks in various passages.²⁵ Nor do we have to discuss the author of the section that is of importance to us, viz. cols. 4.26–21.13, the *Menoneia* proper, as Jones says.²⁶ We know from Galen (XV.25f. Kühn) that there existed a book attributed to Aristotle but which Galen assumes was written by his student Menon. Galen advises his reader to find information about the opinions of earlier physicians in this book. He calls this book an ἰατρικὴ συναγωγὴ or Μενώνεια βιβλία. Galen clearly finds this book a parallel to Theophrastus Φυσικαὶ δόξαι. However, when our view of Theophrastus' work changes, the comparison between Theophrastus and Menon also will have different implications. From the two titles we have no way of determining the content of Menon's book. It is certainly incorrect to call it a "Geschichte der Medizin" since it is entirely concerned with the aetiology of diseases.²⁷ It is very much like the Aristotelian surveys of his predecessors: The main structure of this section of the text is a division into two main types of explanations of disease. Cf. 14.4–12: "Those who state that diseases are caused by surfeit, accounting for them mainly by residues, have been practically all mentioned. . . . After those who attribute the causes of diseases to residues and secretions, let us take a glance at those too who hold that our bodies are composed of a combination of

²⁴ Cf. Mansfeld 1990a, 243–53.

²⁵ Cf. cols. 34.53, 36.3, 38.7.

²⁶ Jones 1947, 2. I quote from his edition and translation.

²⁷ My view of the text was reached before I read D. Manetti's two important papers (1986, 1990). Her analysis of the text and its position in the ancient tradition seems convincing; however, in this context it makes little difference whether the author of the doxographical section was Aristotle or Menon. See also her remarks in *Corpus dei papiri filosofici Greci e Latini* I 1* p. 347–51.

elements. Let us begin with Plato.” Cf. also the beginning of the section (4.26–28): “For while some have said that diseases arise because of the residues from nutriment, others held that they are due to the elements.” That the systematic division is more important than the historical development is also confirmed by the fact that the author discusses Philolaus and Polybus *after* Plato even though they are older than he is. In fact, nothing prevents us from accepting Menon’s text as being part of the usual Aristotelian introduction to the discussion and solution of particular problems.

Let us now turn to the actual fragments of Eudemus’ works on geometry, arithmetic and astronomy which I shall now discuss as being parts of a thematical discussion rather than of a historical account.

Even though Aristotle did not lecture and write extensively on mathematics it may not be a coincidence that the longest text from Eudemus’ book on geometrical research deals with a problem to which Aristotle several times had alluded,²⁸ fr. 140W on Antiphon’s and Hippocrates of Chios’ attempts to square the circle.²⁹ It is assumed that the Antiphon’s demonstration in fr. 140 also goes back to Eudemus because Eutocius in his commentary on Archimedes *De dimensione circuli* = fr. 139W says that Antiphon’s and Hippocrates’ arguments are known by those “who have studied Eudemus’ book on geometrical research (γεωμετρικὴν ἱστορίαν) and are acquainted with the Aristotelian treatises”;³⁰ furthermore, because Eudemus claimed that Antiphon denied the geometrical principle that a magnitude is infinitely divisible

²⁸ Cf. *Cat.* 7b31, *An. Pr.* 69a30, *Soph. El.* 171b15, and *Phys.* 185a16.

²⁹ A good place to check the various attempts to solve this problem is Heath 1921, 220–26. Fr. 140 comes from Simplicius *In Aristotelis Physica*.

³⁰ Assuming that κηρίον refers to the wax tablets of a book, as in *AP* 9.130. Since Eutocius refers to two different sources we cannot be certain that the report on Antiphon must go back to Eudemus. Heiberg 1884, 345 takes κηρία Ἀριστοτελικά as a reference to Arist. *Soph. El.* 11. There is no evidence that κηρία could be used in this way. The mathematician Sporus (3rd cent. AD) wrote a book with this title (Eutocius p. 300.26 Heiberg), probably using the term in the sense in which Aulus Gellius says that some books were called κηρία because they contained “uariam et miscellam et quasi confusaneam doctrinam” (*Noctes Atticae* Praef. 6). Since Simplicius mentions both Euclid and Alexander of Aphrodisias in his discussion it is impossible to determine how much of his discussion goes back to Eudemus. One possible source was Euclid’s *Ψευδάρια*, though we do not know how long this book, now lost, was available to scholars. It is important to notice that the problem of the quadrature of the circle was still a live topic in the days of Simplicius, s. p. 59.23–60.21 Diels.

(p. 55.22–23 Diels).³¹ Eudemus' discussion of Hippocrates is secured by several verbatim quotations from his work, cf. p. 60.27–31 Diels. Eudemus seems to be explicitly critical of both attempts to prove the quadrature of the circle, and he seems to start out from precisely the point which Aristotle raised in his *Physics*, viz. whether or not this was a problem that belonged to geometry, cf. p. 55.25–26 Diels.³² This is one more indication that the geometrical problems were more important to Eudemus than the historical development. We have a single fragment of Eudemus' *Περὶ γωνίας* (fr. 30W), and even if he here adopts a position which may appeal more to philosophers than to mathematicians, it at least demonstrates that Eudemus was interested in geometrical problems.³³

It is important to notice that Simplicius informs us that Eudemus, as opposed to Simplicius' predecessors (especially Alexander of Aphrodisias), stated that Hippocrates' attempt to square a lunar section of the circle was not based on the side of a square but was a more general proof, and that he (Simplicius) will add his own comments to Eudemus because of the "hypomnematic manner of Eudemus, who according to the old custom presents the proofs in a short form" (p. 60.29–30 Diels; cf. p. 63.19–20 Diels).

It is worth noticing that the information coming from the rest of the fragments of Eudemus (still disregarding the historical survey in fr. 133) deals more with some thinkers than others: Thales appears in fr. 134, 135, 143, 144, 145; the Pythagoreans in fr. 136, 137, 141, 142, 146; and fr. 148 and 149 discuss the theories of Eudoxus and Callippus of which the latter certainly is one of Eudemus' contemporaries. The

³¹ If the order in which Simplicius deals with the two mathematicians, Antiphon before Hippocrates, reflects the order in Eudemus, this is yet another indication that Eudemus was more concerned with the arguments than with a historical account. This appears also to be the case in one of the actual quotations from Eudemus' book 2 (p. 61.1–9 Diels).

³² It is, however, necessary to compare the text as given in Diels' edition of Simplicius = fr. 140W with Heiberg's critical discussion of Simplicius' text, Heiberg 1884, 338–44. Wehrli omitted one brief reference to Eudemus p. 69.22–23 Diels "Hippocrates of Chius lived before Aristotle; hence also Eudemus counts him among the older [mathematicians]." Notice also that fr. 149W, on Callippus' improvement on Eudoxus' spherical system, deals with a problem discussed in Arist. *Metaph.* 1073b32.

³³ It is, of course, impossible to determine whether fr. 138 (Oenopides on the angle) should be taken with fr. 30 or with the fragments from the *Geometrical Research*, as Wehrli does.

latter are mentioned in book 2 of the astronomical treatise but since we do not know how many books this work consisted of, it is difficult to take this as an indication of a historical survey.³⁴ It is of course possible that the selection is due to the authors who quote from Eudemus. On the other hand, if Eudemus had written books on the history of science it is remarkable that he is never mentioned in connection with Parmenides, to whom various astronomical discoveries are otherwise attributed, or with Democritus, who according to Thrasyllus' catalogue of books (D.L. 9.47–48) had written extensively on the same subjects. At the time Eudemus was writing, he should have been able to read Parmenides and Democritus, whose writings otherwise appear not to have been read by many before the second century AD.³⁵

The significance of the appearance of Thales and the Pythagoreans is to be explained along different lines. Already Plato had mentioned Thales as an astronomer (*Theaet.* 174a) so it should come as no surprise that Eudemus also claimed that Thales had predicted solar eclipses and solstices (fr. 143–45W). Both Plato and Eudemus must have been influenced by Herodotus (1.74), but Thales was apparently also praised early on in this connection by Xenophanes and Heraclitus, and later in the fifth century BC by Democritus and Aristophanes (*Nub.* 201–16; *Av.* 995ff., 1009).³⁶ We have no way of knowing why Eudemus also attributed specific mathematical discoveries to Thales. Fr. 134 attributes to Thales the theorem that if two triangles have two angles and one side respectively equal, the triangles are equal in all respects (= Euclid 1.26); this, Eudemus claims, was a necessary theorem to measure the distances of ships from the shore in the manner some authorities claimed that Thales used. Fr. 135 attributes to Thales the discovery that if two straight lines cut one another, the vertical and opposite angles are equal;

³⁴ If Hippocrates and Antiphon appeared in book 2 of the geometrical treatise and Eudoxus and Callippus in book 2 of the astronomical treatise, it seems very unlikely that Eudemus' two works are to be identified with the two titles of similar wording in the catalogue of Theophrastus' books (137 no. 43 FHS&G and 264 no. 3 FHS&G) since the Theophrastean books consisted of respectively 6 and 4 books: there would be too much space left for a history of the developments of the fourth/third century.

³⁵ Eudemus discusses the physical views of Democritus in fr. 54W a + b. Notice that Theophrastus wrote a book *On the Astronomy of Democritus* (title no. 89 FHS&G), and that even Archimedes knew about Democritus' geometry, cf. DK 68B155 app. crit. It is also surprising that Anaximander is only mentioned twice, fr. 145–46W.

³⁶ And in the 3rd century BC by Callimachus and Timon (D.L. 1.23 & 34 = DK 11A1). On Thales in the early period, cf. Panchenko in this volume.

the real proof was given by Euclid, as Proclus informs us, and we do not know the context in Eudemus.³⁷ Considering Eudemus' apparent interest in angles, it may be worth noticing that both theorems explicitly attributed to Thales by Eudemus concern angles.³⁸ If we could be sure that Proclus' note (p. 250.20 Friedlein = DK 11A20) that Thales used the archaic expression ὁμοιος to mean ἴσος goes back to Eudemus, it appears likely that the two books which were explicitly attributed to Thales: *On the Solstice* and *The Equinoxes* (D.L. 1.23 and Suda s.v. Thales) were still in circulation by Eudemus' time;³⁹ but probably the fact that Aristotle had made Thales the originator of philosophy combined with the earlier tradition of Thales' scientific discoveries was sufficient for Eudemus to attribute some ideas to Thales. And it is also important to notice that the discoveries attributed to Thales are brought up in connection with Euclid, and this indicates that they were issues that were discussed in the period of, and shortly after, Eudemus.

Aristotle does not attribute the beginning or development of mathematics to Pythagoras himself but only says that "Contemporaneously with [Leucippus and Democritus] and before them, the so-called Pythagoreans were the first to take up mathematics; they advanced this study, and having been brought up in it they thought its principles were the principles of all things" (*Metaph.* 985b23ff.).⁴⁰ Aristotle was of course interested in the ontological principles and not the history of mathematics, but it is hardly a coincidence that two of his pupils seem to have stressed the importance of Pythagoras and the Pythagoreans in the development of mathematics and geometry. Aristoxenus (fr. 23W)

³⁷ Fr. 134–35 come from Proclus' commentary on Euclid; so may two other passages in Proclus that mention Thales as a geometer, cf. DK 11A20, but not included in Wehrli. If we add the three other theorems attributed to Thales, only the observation that a circle is bisected by its diameter has nothing to do with angles. – On Thales' geometry and mathematics, cf. Heath 1921, 130–37; Burkert 1972, 415–17; and Gladigow 1968.

³⁸ As does also fr. 138 on Oenopides.

³⁹ Cf. also P.Oxy. 3710. col. 2 which seems to indicate that Thales' view was discussed in Hellenistic Alexandria. – As István Bodnar has made me aware, the text of Diogenes clearly indicates that Thales wrote two books, not one, as most editors assume. The Suda only mentions one book *On the Equinox*.

⁴⁰ Tr. in Burkert 1972, 412; and see Burkert's discussion of the whole question, 412–15. If Aristotle fr. 191 Rose = p. 130 Ross also includes the statement "After these, chronologically, Pythagoras, the son of Mnesarchus, first worked at mathematics and numbers. . .," and if this is not a transitional phrase by Apollonius, as claimed by Burkert, there is an Aristotelian precedent for Eudemus' view.

says that "Pythagoras seems to have honored, most of all, the study of numbers," while Eudemus attributes specific ideas to the Pythagoreans (cf. above). For us the issue is not whether Pythagoras and his early successors were concerned with mathematics but that Eudemus attributed certain mathematical theorems to the Pythagoreans; it is quite possible that he is referring to later Pythagoreans (like Archytas). The two geometrical attributions are mentioned by Proclus in his commentary on Euclid (frr. 136–37W), i.e. once again Eudemus is discussing problems that were still under investigation in his own period: Eudemus (fr. 136) in fact gives a proof for the proposition that in any triangle the sum of the interior angles is equal to two right angles, which differs from Euclid's proof (1.32).⁴¹ Fr. 137 concerns the application of areas (cf. Euclid i.44–45 and 6.25), but it is impossible to determine how much of the text is due to Eudemus, how much to Proclus, and hence impossible to determine its significance vis-à-vis Eudemus.

Fr. 141 is part of Eutocius' presentation of various attempts to solve the famous problem of the duplication of the cube, the so-called Delian problem. We do not know why Eudemus is quoted specifically for Archytas' solution; it was apparently a hot topic throughout the fourth century BC, and it is strange that Eudemus is not mentioned in connection with the other solutions if he in fact did write a history of geometry.

The significance of fr. 146, on the order of the planets, is that Eudemus attributes the discovery of the order known from Plato and Aristotle to the Pythagoreans; he may very well refer to Philolaus, who indeed seems to have been the first to establish this order.⁴² Simplicius quotes Eudemus in his commentary on Arist. *De caelo* 2.10, where Aristotle refers the question of the order of the planets to the astronomers, but Aristotle also deals extensively with the Pythagoreans in 2.13, on the position of the earth. Thus, Eudemus may be expanding on Aristotle; in fact, most of the astronomical information in frr. 143–49 deal specifically with (the explanation of) celestial movements.

The final item on the Pythagoreans is fr. 142W, that the Pythagoreans used arithmetic $\pi\upsilon\theta\mu\acute{\epsilon}\nu\epsilon\varsigma$ to express the ratios of the quart, the quint and the octave by means of the numbers 2, 3, and 4, adding up to 9. Since this comes from his book on arithmetic research, it is probably the

⁴¹ Notice that angles once more are of concern to Eudemus.

⁴² Cf. Burkert 1972, 308–22, and Huffman 1993, 240–61.

numerical and not the musical aspects that interest Eudemus. It is noteworthy that he mentions the number 9 rather than 10 as being important, though it is difficult to see how it was possible to express the ratios without the use of the number one. To the best of my knowledge, this explanation is not mentioned anywhere else. This *may* be part of a historical survey, but the ratios of tones in the musical scale was also a topic on which Aristotle and his pupils wrote a good deal.⁴³

To sum up: considering the facts (a) that the fragments assigned to Eudemus' so-called *History of Geometry*, etc. deal with a limited number of problems, (b) that most of these problems were problems that originated from Aristotelian discussions and were issues which were still under discussion at the time of Eudemus, and (c) that the titles of Eudemus' books are likely to have the same meaning as the corresponding titles in the catalogues of Aristotle's and Theophrastus' books, there is little reason to assume that Eudemus wrote books on the history of science.⁴⁴ But there will, on the other hand, be more reason to be impressed with Eudemus' own contributions to Peripatetic philosophy. And if I am right in denying Eudemus the honor of being the first historian of science, the loss of a unique source of all knowledge about early Greek science corresponds to what has now happened to Theophrastus, who is no longer the one and only source of all ancient doxography.⁴⁵

Finally, there is one more important question to ask if my conclusion is accepted: what consequences does this have for the historiography of ancient science? Very little: the amount of information relating to the history of science in antiquity remains the same, and it is no less or no more reliable. But perhaps we must now pay more attention to *what*

⁴³ Cf. Aristotle fr. 47 Rose = p. 92 Ross, Theophrastus fr. 716 FHS&G, and, of course, Aristoxenus; cf. also Xenocrates fr. 9 Heinze for the attribution of the traditional ratios of the quart, the quint and the octave, adding up to the decade. – The modern writers on (Pythagorean) music are remarkably silent on this text. Even if it is possible that Eudemus' version is no more than a variation of what is usually expressed with the tetractys, it deserves notice.

⁴⁴ In fact, the attribution of fragments which are not explicitly quoted from Eudemus' ἱστορίαι to what are considered works on the history of Geometry, Arithmetic or Astronomy is arbitrary. Cf. also Wehrli's remark "Die Schrift [on astronomy] überschneidet stellenweise (fr. 145) mit Theophrasts Φυσικῶν δόξαι," Wehrli 1968, 119; see above p. 251.

⁴⁵ See above, note 22.

later Greek scientists and authors chose to tell us about their predecessors, and *why* they chose to do so.⁴⁶

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⁴⁶ I am grateful to my colleague, dr. phil. C. M. Taisbak, for elucidating a number of the mathematical problems for me, and to István Bodnár for his careful review of my paper.

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13

Eudemos' History of Mathematics*

Leonid Zhmud

1

About the founder of the historiography of science Eudemos of Rhodes we know very little. Ancient sources depict him as a devoted student of Aristotle, who even considered him (along with Theophrastus) as a possible scholarch of the Lyceum (fr. 5). We know neither when he was born, nor when he joined the Lyceum. Eudemos certainly was younger than Theophrastus (born c. 370) and after Aristotle's death he returned to Rhodes, where he continued to study and to teach (fr. 88). While Eudemos' *Physics* belongs to the second period of his activity, his works on the history of science must have been written while still in Athens. Being a part of Aristotle's historiographical project, along with Theophrastus' "physical" doxography and Menon's medical doxography, they can be dated between 335/4 (foundation of the Lyceum) and 322/1 (Eudemos' return to Rhodes). In the

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list of Theophrastus' works there are three writings on the history of science with the same titles as Eudemus' works.¹ Since there are no traces of such writings by Theophrastus, the editors of his fragments believe that these were Eudemus' works, which were later mistakenly added to Theophrastus' list.² This misunderstanding indirectly confirms that all these works were written before Eudemus left Athens, otherwise they would hardly have been in Theophrastus' catalogue.

Beginning with Simplicius, the majority of those who have studied Eudemus' theoretical treatises agree that in this domain he was a true follower of Aristotle, clarifying his ideas and arranging them more systematically. But although Eudemus did not succeed much in developing Aristotle's system, or in creating his own philosophical system, this does not mean that he was bereft of originality. Since Aristotelianism by its very nature resisted any attempt at substantial modification, the Peripatetics became famous not so much in philosophy, but in the specific sciences. There is no doubt that ancient musicology, geography, botany and physics would appear incomparably more inferior without Aristoxenus, Dicaearchus, Theophrastus and Strato. Such an appraisal seems all the more appropriate to the historiography of science, as Eudemus' writings happened to be not only the first but also the last specimens of that genre in antiquity. To be sure, neither Eudemus himself, nor his works have been forgotten: they were still extant in the sixth century AD,³ and a special biography was devoted to Eudemus.⁴

¹ Ἀστρολογικῆς ἱστορίας α'–ζ', Ἀριθμητικῶν ἱστοριῶν (without the number of books), Ἱστορικῶν γεωμετρικῶν α'–δ' (D.L. V.48, 50 = 137 Nr. 43, 264 Nr. 2–3 FHS&G).

² This was suggested first by H. Usener. In the same list we find another work, τῶν περὶ τὸ θεῖον ἱστορίας α'–ζ', which contrary to Wehrli's opinion should be identified with Eudemus' *History of theology*, known from Damascius (251 Nr. 2 FHS&G = Eud. fr. 150). Cf. Damascius' reference κατὰ τὴν Εὐδόξου ἱστορίαν (Wehrli p. 70.6).

³ Simplicius gives a long verbatim quotation from the *History of geometry* (fr. 140) and cites about a hundred passages from Eudemus' *Physics*; he also gives three of the seven quotations preserved from the *History of astronomy* (fr. 146, 148–49); in quoting Eudemus, he makes it clear that he is dealing with his book (fr. 149). Eutocius also indicates that he has read the *History of geometry* (fr. 139). Damascius apparently used Eudemus' *History of theology* without intermediaries (fr. 150).

⁴ This biography (fr. 1), written by a certain Damas, is mentioned only by Simplicius. When Damas lived is unknown, but one can guess that he was Eudemus' student rather than a later biographer. Eudemus was not such a popular figure that a late author would be interested in writing his biography; besides, what were his possible sources? Eudemus' biography is mentioned in the Arabic sources (Rosenthal p. 36).

And yet in this particular genre he appeared to have no followers even among those who displayed some interest in the history of mathematics and astronomy. Eratosthenes dealt with the problem of the duplication of the cube in his dialogue *Platonicus* and in the letter to king Ptolemy.⁵ Hellenistic biographies of the famous scientists, popular "introductions" to the mathematical sciences, and later philosophical and scientific commentaries also included information on the history of the exact sciences. Each of these genres had, however, its own aims that only partially coincided with the aims of the history of science. Thus, in a general perspective, Eudemos' history of exact sciences happened to be not so much a promising beginning, as an exception.

Does his failure to found his own school explain the abortive development of the history of the exact sciences? Even if Eudemos really had only two students,⁶ Theophrastus had two thousand listeners (D.L. V.37), and nonetheless his botanical research was not further developed. Meanwhile the biographical genre founded by Aristoxenus and Dicaearchus, of whose students we also know nothing, was immediately picked up by the Hellenistic writers, since it corresponded to the interests and spirit of the epoch. It is revealing that Eratosthenes, who as a mathematician and historian could have continued Eudemos' history of mathematics, attempted instead of this to change the framework of the genre. In accordance with Eratosthenes' philosophical predisposition, the fictitious plot of the *Platonicus* combines a sober history of mathematics with the academic legends about Plato as architect of science. However, even this attempt to make this genre more popular and accessible had only limited success: although the *Platonicus* was widely known, we do not hear of any followers of Eratosthenes in the "belletristic" history of the exact sciences.

In spite of the general decay of this genre, I would not say that Eudemos "was virtually unknown" in the Hellenistic period,⁷ especially taking into account that we possess only meager remains of the vast Hellenistic literature. Eratosthenes, and probably Archimedes, drew upon his *History of geometry*; Diogenes Laertius and Clement of Alex-

⁵ Knorr (1986) p. 17ff., Knorr (1989) p. 131ff. brings convincing arguments that this letter is not a forgery.

⁶ Gottschalk p. 26. This seems to me rather improbable. A fragment of Eudemos' *Physics*, written on Rhodes, depicts a typical picture of a teacher lecturing to a group of students: καὶ γὰρ μυθολογήσω τὸ ῥαβδίον ἔχων ὑμῖν καθημένοις οὕτω (fr. 88).

⁷ Ibid.

andria, known for their extensive use of the Hellenistic sources, cite his *History of astronomy* (fr. 143–44).⁸ Later, Eudemus' theoretical treatises remained of interest only to Aristotle's commentators, whereas his works on the history of the exact sciences were not infrequently used by those who took these sciences up in one way or another: Theon of Smyrna, Porphyry, Pappus, Proclus, Eutocius. Thus, Eudemus — the expert in the exact sciences, their first and perhaps only historian, was not less important for the classical tradition than Eudemus — the true follower of Aristotle.

Judging by his works, Eudemus received a good mathematical education and was very competent in the problems of contemporary mathematics.⁹ Eudemus' professional training is also manifest in the fact that his histories of the exact sciences are devoted to strictly mathematical problems and methods, and not to the philosophical interpretation of mathematics which was so characteristic of Plato and all his students, including Aristotle. To be sure, a professional approach to mathematics was not the only possibility for Eudemus, as a fragment from his work *On Angle* shows (fr. 30). There he treats an angle as a certain quality, i.e., in the spirit of Aristotle.¹⁰ An interesting fragment from Eudemus' *Physics* (fr. 34) reveals one of the possibilities of combining philosophical and mathematical approaches.

According to Eudemus, after the mathematicians have defined their ἀρχαί and reached an agreement about them, they carry their research further. They refuse to study and to prove mathematical ἀρχαί, saying that this is not their business (ἀλλ' οὐδέ φασιν αὐτῶν εἶναι ταῦτα ἐπισκοπεῖν). Therefore, there is another science (ἐτέρα φιλοσοφία) to deal with these ἀρχαί, i.e., Aristotelian “first philosophy,” or “wisdom.”¹¹ Eudemus' position is thus very close to that of Plato and Aristotle, but in contrast to Plato who reproaches the mathematicians for the lack of interest in proving their ἀρχαί (*Resp.* 510C–E), Eudemus seems to consider the division of labor between philosophers and math-

⁸ See also: Eud. fr. 89 ap. D.L. I.9; fr. 145, Dercyllides ap. Theon of Smyrna.

⁹ Contrary to Aristotle, who believed that Hippocrates of Chios committed a logical fallacy in his quadrature of lunes (*Soph. El.* 171b12f.), Eudemus did not find any mistakes in Hippocrates' proofs (fr. 140). See: Lloyd. Aristotle was quite competent in elementary mathematics, but did not reveal a particular interest in the higher mathematics of the period: Heath (1949) p. 1f.

¹⁰ Arist. *Cat.* 10a11–24, *Phys.* 188a25, *Met.* 1020a35–b8. See Heath (1927) p. 177f.

¹¹ Cf. *Met.* 995b4f.; 996b26f., 1005a19ff.

ematicians as quite normal. Indeed, the mathematicians do not want to prove their ἀρχαί not because of their failure to think things through, but rather because such a position corresponds to the general rule according to which no one scientific discipline can prove its own ἀρχαί. Proceeding on such an understanding of the division of labor, one can suppose that when Eudemus deals with subjects that are in the jurisdiction of the mathematicians, he prefers to follow their norms and rules. Owing to this, his exposition of the history of exact sciences appears to be free from the preconceived philosophical tenets — at least free to such an extent that they do not harm the professional approach.¹²

2

If we confine ourselves to those of Wehrli's fragments where Eudemus' name is mentioned, leaving aside for the moment the so-called *Catalogue of geometers*,¹³ it turns out that there is not much material preserved from the *History of geometry*. Frr. 134–35 concern theorems of Thales, frr. 136–37 Pythagorean mathematics, fr. 138 Oenopides, frr. 139–40 the quadrature of a circle by Antiphon and the quadrature of lunes by Hippocrates of Chios, fr. 141 Archytas' solution to the problem of the duplication of the cube, and fr. 141.I the theory of irrationals developed by Theaetetus. The origins of these fragments vary and even taken together they are far from giving us an idea of what was the original scope of Eudemus' book.¹⁴ Of the nine fragments preserved under his name, five deal with the propositions of Euclid's book I (they come from Proclus' commentary on this book), one with those of book X (on the theory of irrationals, from Pappus), and the other three concern problems outside the scope of the *Elements* (two from Eutocius and one very long quotation from Simplicius). Thus, in their entirety Eudemus' fragments do not cover even one tenth of the material that — judging by the *Catalogue* in Proclus — was collected and examined in the *History of geometry*. Of the twenty mathematicians

¹² The case of Aristoxenus is instructive as to the influence of Aristotelian philosophy on the professional approach. In his youth Aristoxenus studied with the Pythagoreans, but joining the Lyceum he abandoned the mathematical theory of music and developed his own harmonics, based on the qualitative approach to musical sound.

¹³ Procl. *In Eucl.* p. 64.16–68.23 Friedlein = fr. 133. See below, section 3.

¹⁴ The only fragment from his *History of arithmetic* (fr. 142) also deals not so much with arithmetic, as with Pythagorean harmonics, i.e., with the mathematical theory of music.

mentioned in the *Catalogue*,¹⁵ we find only five in the fragments, plus Antiphon, who is omitted from the *Catalogue*.

In reconstructing the original scope of the *History of geometry* we can rely on these fragments as solid ground, yet we cannot confine ourselves only to them. It is well known that for the late authors Eudemus was one of the main sources, if not *the* main source of information on pre-Euclidean geometry. This does not mean, of course, that *any* anonymous evidence concerning early Greek mathematics goes back to Eudemus. Nevertheless, there are many cases where his authorship seems to be firmly established. Proclus, for example, informs us about two of Thales' theorems with a reference to Eudemus (frr. 134–35), and about two others without mentioning his sources.¹⁶ It seems rather obvious that the latter two pieces of evidence are likewise based on Eudemus' authority.¹⁷ The same conclusion can be reached about two of Oenopides' discoveries, one of which Proclus mentions with reference to Eudemus (fr. 138) and the other without it (p. 283.7f.).¹⁸

Here is another example: who was the authority for Proclus' information (p. 304.11f.) that the Pythagoreans had knowledge of the theorem that only the following polygons can fill up the space about a point: the equilateral triangle, the square, and the regular hexagon? There is no such theorem in Euclid, but his older contemporary Eudemus could have referred to this, as well as to other Pythagorean discoveries.¹⁹ It seems very likely that the two pieces of evidence from the scholia to Euclid also go back to Eudemus: first, that the whole fourth book of Euclid belongs to the Pythagoreans, and second, that they constructed three regular solids (pyramid, cube and dodecahedron), whereas the octahedron and icosahedron were discovered by Theaetetus.²⁰ Eudemus, as we remember, wrote both on the Pythagoreans and on Theaetetus and definitively knew the subject better than those later

¹⁵ I include in this number Philip of Opus, but not Plato. Hippias of Elis is mentioned here only as a source, and not as a mathematician.

¹⁶ *In Eucl.* p. 157.10f., 250.20f.

¹⁷ van Pesch p. 78f.; Heath (1927) p. 36.

¹⁸ *Ibid.* It is very possible also that Eutocius, who derived Archytas' solution to the problem of doubling the cube from Eudemus (fr. 141), owes his information about the solutions of Eudoxus and Menaechmus to the same source (*In Archim. De sphaer.* III, p. 56.1ff., 78.13–80.24 Heiberg). See: Wehrli p. 118; Knorr (1986) p. 21; Knorr (1989) p. 77ff., 94ff.

¹⁹ van Pesch p. 79; Heath (1927) p. 36.

²⁰ *Schol. in Eucl.* p. 273.3–13, 654.3f. Heiberg. See Burkert (1972) p. 450.

authors who made Pythagoras the originator of all five regular solids.²¹ The anonymous scholia to book V of the *Elements* twice call Eudoxus the author of this book, which also may have Eudemos as the source.²²

The last proposition of the fourth book, on the fifteen-angled figure inscribed in the circle (IV.16), deserves special attention. Proclus, relying on the earlier commentaries on Euclid, notes that in the *Elements* there are not a few theorems and problems useful for astronomy, e.g., the problem IV.16 (p. 269.8ff.). The same is said here about the problem I.12 that belongs to Oenopides: "he thought it useful in astronomy" (p. 283.7f.). Since the last reference, as we noted, goes back to Eudemos, one can suspect that this remark too has the same origin. Proclus explains further that by inscribing the side of the fifteen-angled figure in the circle we get the angle between the celestial equator and the zodiacal circle, i.e. 24° . Here we should remember that Oenopides was that very astronomer who first measured the angle of the obliquity of ecliptic (41A7). In a short but regrettably error ridden résumé of Eudemos' *History of astronomy* we find decisive evidence: "Oenopides was the first who found the obliquity of the zodiacal circle,"²³ whereas "the others found that the angle between the zodiacal circle and the celestial equator is equal to the side of the fifteen-angled figure, or 24° " (fr. 145). K. von Fritz demonstrated long ago that originally both statements pertaining to the zodiac referred to Oenopides.²⁴ Therefore, Proclus' evidence on the astronomical significance of the problem IV.16 also goes back to Eudemos, although Proclus mentions neither his, nor Oenopides' name.²⁵

In fr. 141.I from the Arabic translation of Pappus, overlooked in the first Wehrli edition, Eudemos speaks about Theaetetus' contribution to the theory of irrationals. This fragment was added to the second edition, but Wehrli, following Burkert, does not include in it the preceding note on the Pythagoreans. It is clear from the text, however, that Eudemos

²¹ This tradition is preserved in Proclus' *Catalogue* (*In Eucl.* p. 65.15f.). See below, p. 286.

²² *Schol. in Eucl.* p. 280.7f., 282.12f. Heiberg.

²³ Diels' correction, $\lambda\acute{o}\xi\omega\sigma\iota\varsigma$ instead of manuscript $\delta\iota\acute{\alpha}\zeta\omega\sigma\iota\varsigma$ (Theon Smyrn. *Exp.* p. 198.15 Hiller = 41A7), is fully justified by the parallels in Aëtius, Diodorus and Macrobius (41A7).

²⁴ von Fritz (1937) col. 2260f.

²⁵ According to Neuenschwander p. 374 the style of this problem differs from the other propositions of book IV, so it seems to be a later addition.

considered Theaetetus to continue and develop already *existing* theory. Hence, the preceding note (omitted by Wehrli), “This science had its origin in the school of Pythagoras, but underwent important development at the hands of Theaetetus,”²⁶ perfectly fits in such a context.²⁷ Among the predecessors of Theaetetus at least one person had to be mentioned: his Pythagorean teacher Theodorus of Cyrene. Theodorus is named as well in the *Catalogue* (p. 66.6), and Plato (*Theaet.* 147D) ascribes to him a proof of irrationality of the magnitudes between $\sqrt{3}$ and $\sqrt{7}$. Further, it seems very improbable that Eudemus, who left a detailed account on the authorship of many elementary propositions, would neglect to say something about the discovery of irrationality, which was made *before* Theodorus. In any case, it would be contrary to Eudemus’ usual manner to mention Theaetetus (and Theodorus) without saying a word about the $\pi\rho\omega\tau\omicron\varsigma$ εὐρετής of irrationality, Hippasus of Metapontum.²⁸ Although Hippasus’ name is not attested either in the *Catalogue*, or in the fragments, Eudemus in all likelihood did write about him too.

In the same fr. 141.I it is said that Theaetetus used in his theory three proportions, the arithmetic, geometric and harmonic, whereas in the *Catalogue* we read that Eudoxus added to the three known proportions three others (p. 67.2f.). If the information of the *Catalogue* goes back to Eudemus (and there are no grounds to doubt this), we can surmise that he mentioned also who discovered the first three proportions. In this connection I would like to draw attention to the reports of Nicomachus and Iamblichus on the discovery of the proportions. According to Nicomachus, the first three of them “came down to Plato and Aristotle from Pythagoras,” the second three, subcontrary to them, which are called the fourth, fifth, and sixth, were discovered later; af-

²⁶ Pappus, p. 63–64; cf. Burkert (1972) p. 440 n. 182.

²⁷ Scholia to book X of Euclid also mention Pythagoreans as the originators of the theory of irrationality (p. 415.7, 416.13, 417.12f. Heiberg). Burkert’s position in this question is inconsistent. He states that: 1) Eudemus, quoted by Pappus, does not mention the Pythagoreans; 2) scholia to book X are mostly from Pappus; 3) the same scholia, ascribing discovery of the irrationality to the Pythagoreans, are based ultimately on Eudemus. Cf. Burkert (1972) p. 450 n. 13, 457, 458 n. 57, 462 nn. 73–74. This contradiction can be easily reconciled by suggesting that Pappus’ reference to the Pythagoreans goes back to Eudemus as well.

²⁸ Cf. his note on the discovery of the regular solids by the Pythagoreans and Theaetetus (*Schol. in Eucl.* p. 654.3f. Heiberg) and below, n. 49. On Hippasus see below, p. 287.

ter which the moderns discover four others as well.²⁹ Thus, it comes out that the first three proportions were discovered by Pythagoras, the second three by contemporaries of Plato and Aristotle, and the last four by later mathematicians. This information is correct, but it lacks details that would allow us to connect it with Eudemos. We find such details, however, in Iamblichus' commentary to Nicomachus:

Of old there were but three means in the days of Pythagoras and the mathematicians of his times, the arithmetic, the geometric, and the third in order, which once was called the subcontrary, but had its own name changed forthwith to harmonic by Archytas and Hippasus, because it seemed to embrace the ratios that govern the harmonized and tuneful. And it was formerly called subcontrary because its character was somehow subcontrary to the arithmetic . . . After this name has been changed, those who came later, Eudoxus and his school, invented three more means, and called the fourth properly subcontrary because its properties were subcontrary to the harmonic . . . and the other two they named simply from their order, fifth and sixth. The ancients and their successors thought that this number, i.e., six, of means could be set up; but the moderns have found four more in addition . . .³⁰

It is clear that we have a fragment of the history of mathematics before us, taken by Iamblichus from some reliable and well-informed source. It contains the names of Hippasus, Archytas and Eudoxus that were missing in Nicomachus, along with much additional information on the early history of proportions. This information perfectly matches the fragment of Archytas quoted by Porphyry: there are three means in music, the arithmetic, geometric, and subcontrary "that we call harmonic."³¹ Since Eudemos ascribes an application of the first three proportions to Theaetetus and a discovery of the three others to Eudoxus, Iamblichus' passage likewise has to be connected with Eudemos. Specifically, he seemed to mention not only Eudoxus but also Pythagoras (in connection with the discovery of the first three means), as well as Hippasus and Archytas (as his followers).³² Interestingly, Iamblichus

²⁹ *Intr. arith.* p. 122.11f., 142.21f. Hoche.

³⁰ *In Nicom.* p. 100.19–101.9 Pistelli = 18A15, tr. M. L. D'Ooge.

³¹ *In Ptol. Harm.* p. 92 Düring = 47B2. Philolaus also called this mean "harmonic" (*Nicom. Intr. arith.* p. 135.10f. Hoche = 44A24), which makes clear that it has been renamed before Archytas. Tannery believed that Archytas quoted Hippasus (Tannery [1885] p. 190). Even if this was not the case, Archytas surely could have mentioned his name (cf. 47A13, B1).

³² According to Aristoxenus (fr. 90 Wehrli), Hippasus made an experiment with four bronze discs, using the so-called "musical proportion" ($6:8 = 9:12$) that includes

turns two more times to the history of proportions, saying again that the first three come from Hippasus and Archytas, whereas the first six were used from the times of Plato until Eratosthenes.³³ His immediate source here was in all probability Porphyry's commentary on the *Elements*, which traced the history of means from Pythagoras to Eratosthenes, relying mainly on Eudemus.³⁴

The name of the first author of *Elements*, Hippocrates of Chios, occurs both in the *Catalogue* (p. 66.4) and in two of Eudemus' fragments (fr. 139–40). As follows from his detailed account on the quadrature of lunes (fr. 140), Eudemus was well acquainted with Hippocrates' work and highly estimated his contribution to mathematics. In Eratosthenes' letter to king Ptolemy, devoted to the problem of the duplication of the cube, it is said that

Hippocrates of Chios first conceived (πρῶτος ἐπένοήσεν) that if, for two given lines, two mean proportionals were found in continued proportion, the cube will be doubled. Whence he turned his puzzle (ἀπόρημα) into another no less puzzling.³⁵

These words almost certainly go back to Eudemus, on whose material Eratosthenes heavily relied.³⁶ In Proclus we find a similar account of Hippocrates. Giving a definition of the ἀπαγωγή, i.e., of the reduction of a complicated problem to another which, if known or constructed,

both the arithmetic and harmonic means. This clearly shows that the first three means were known not only to him, but also to his teacher Pythagoras, whose acoustical experiments Hippasus has followed: Zhmud (1997) p. 191ff. Iamblichus connects the "musical proportion" with Pythagoras and Philolaus (*In Nicom.* p. 118.23f. Pistelli = 44A24). On the theory of proportions in the Pythagorean school see Heath (1921) vol. I, p. 85f.

³³ *In Nicom.* p. 113.16f., 116.1f. Pistelli. Since Eratosthenes studied all the ten means, it was probably him who discovered the last four: Wolfer p. 20ff.; van der Waerden (1956) p. 385. Iamblichus erroneously ascribes these four means not to Eratosthenes, but to otherwise unknown Pythagoreans (*ibid.* p. 116.5).

³⁴ See below, p. 283. Lasserre (1966) p. 175 connects Iamblichus' passage with Eudemus via Eratosthenes' *Platonicus*. Wolfer, however, rightly points out (p. 24) that in this dialogue only the first three proportions known to Plato were discussed. Besides, in Iamblichus' passage the name of the *Platonicus*' main hero is missing, whereas Nicomachus, Theon of Smyrna, and Pappus, who knew the material of this dialogue, did not mention Eudoxus in connection with the proportions.

³⁵ Eutoc. *In Archim. De sphaer.* III, p. 88.18–23 Heiberg = 42A4, tr. Knorr (1989) p. 147. Cf. above, n. 5.

³⁶ Wehrli p. 118f.; Knorr (1986) p. 21.

will make the original proposition evident, he adds: so, for example, the problem of doubling the cube was reduced to the finding of two means in continuous proportion between two given straight lines.

They say that the first to effect reduction (ἀπαγωγή) of difficult constructions (τῶν ἀπορουμένων διαγραμμάτων) was Hippocrates of Chios, who also squared the lune and made many other discoveries in geometry, being a man of genius when it came to construction, if there ever was one.³⁷

As follows from Proclus' φασί, we have here a reference to a source, which seems to be the same as that of Eratosthenes. In both cases Hippocrates is called πρῶτος εὕρετής of the reduction of the problem of doubling the cube, and this was a standard method of Eudemus for describing mathematical and astronomical discoveries.³⁸ In both cases the same ἀπόρημα, i.e., a difficult geometric puzzle, is in question, which Hippocrates reduced to the other problem. It is revealing that for the first time ἀπαγωγή is mentioned in Aristotle (*An. Pr.* 69a25), and as an example of its application he brings the problem of quadrature of the circle with the help of the lunes (69a30–34), i.e., the famous problem of Hippocrates!³⁹ It is quite natural that Aristotle's student also applied the term ἀπαγωγή to Hippocrates' method, which allows us to ascribe Proclus' note to Eudemus. To him, probably, belong as well the words of admiration of Hippocrates' talent, much more suitable for the classical than for the later author.

In Diogenes Laertius' biography of Archytas there is a passage that also can be connected with Eudemus. In this passage Archytas is called πρῶτος twice:

He was the first to bring mechanics to a system by applying mathematical principles; he also first employed mechanical motion (κίνησις ὀργανικὴ) in a geometrical construction, namely, when he tried, by means of a section of a half-cylinder, to find two mean proportionals in order to duplicate the cube (VIII.83, tr. R. Hicks).

The immediate source of Diogenes is likely to be Favorinus: he was very much interested in various εὐρήματα and mentioned elsewhere Archytas' discoveries in mechanics.⁴⁰ Favorinus, in turn, could have

³⁷ In *Eucl.* p. 213.7–11, tr. G. Morrow.

³⁸ See below, n. 158.

³⁹ *Soph. El.* 171b12f. = 42A3; see below, n. 46 and Knorr (1986) p. 71f.

⁴⁰ Fr. 66 Mensching = 47A10a. The passages in Diogenes Laertius where he enu-

relied on Eratosthenes, who certainly used Eudemus.⁴¹ The second part of Diogenes' passage closely matches both Eratosthenes' letter that also mentions half-cylinders⁴² and Archytas' solution to the problem of doubling the cube, known from Eudemus (fr. 140). Does the first part come from the same source too? An obvious symmetry between the two parts of the passage indicates that they belong to the same context: Archytas applied mathematics to mechanics and (mechanical) motion to mathematics.⁴³ Eudemus wrote on Archytas both in the *History of geometry* and in the *Physics*, where he states that Archytas considered things unequal (τὸ ἄνισον) and uneven (τὸ ἀνώμαλον) to be causes of motion (fr. 60). Fr. Krafft has appropriately connected this idea with the main principle of motion in Aristotle's *Mechanical problems*, i.e., with the principle of the unequal concentric circles, and concluded that Aristotle drew upon Archytas' *Mechanics*.⁴⁴ Hence, Archytas as the founder of mechanics was known to Eudemus, which confirms his authority in Diogenes Laertius' passage.

Another piece of evidence is the passage from the *Quadrature of parabola*, where Archimedes refers to the geometers who tried to square a circle but, according to the opinion of most experts, failed to do so.⁴⁵ He clearly means here the attempts of Hippocrates, Antiphon, and Bryson to square a circle that were briefly mentioned by Aristotle⁴⁶ and more extensively treated by Eudemus (frr. 139–40; he, however, passes over Bryson in silence). Since Eudemus, in contrast to Aristotle, usually presented both the geometrical procedures and his own judgment concerning them, he is almost surely included among the experts to whom Archimedes alludes.

merates one εὔρημα after another usually derive from Favorinus. In his *Manifold history* there was a special book on πρῶτοι εὑρεταί : Mensching p. 31f., 161 (index on the word πρῶτος).

⁴¹ Cf. fr. 27 Mensching (Eratosthenes as a source). Favorinus' contemporary and friend Plutarch also drew upon Eratosthenes' *Platonicus* and mentioned some ὀργανικαὶ καὶ μηχανικαὶ κατασκευαί designed by Archytas, Eudoxus, and Menaechmus (*Quaest. conv.* 718E).

⁴² Eutoc. *In Archim. De sphaer.* III p. 96.6 Heiberg.

⁴³ See Heath (1921) p. 246f.; van der Waerden (1956) p. 150f.; cf. Knorr (1989) p. 109.

⁴⁴ Krafft p. 149f.

⁴⁵ διόπερ αὐτοῖς ὑπὸ τῶν πλείστων οὐχ εὐρισκόμενα ταῦτα κατεγνώσθην (II, p. 262.13ff. Heiberg).

⁴⁶ *Cat.* 7b27f., *An. Pr.* 69a30–34, 75b37f., *Soph. El.* 171b12f., b34ff.; *Phys.* 185a14f.

The following example is less obvious, but no less interesting. In the introduction to his work the *Method*, Archimedes writes:

In the case of the theorems the proof of which Eudoxus was first to discover, namely, that the cone is a third part of the cylinder, and the pyramid of the prism, having the same base and equal height, we should give no small share of credit to Democritus, who was the first to make assertion with regard to the said figure though he did not prove it.⁴⁷

Archimedes refers to Democritus only once and hardly knew his works. Eudoxus, as it seems, also does not mention Democritus. This follows from the introduction to Archimedes' treatise *On the sphere and cylinder*, written before the *Method*, where he refers to the *same* discoveries of Eudoxus, adding that before him no geometer came to these ideas.⁴⁸ Thus, at that point, Archimedes did not know of any of Eudoxus' predecessors in this field. Later, in the *Method* he corrects his view, but was this correction due to his acquaintance with Democritus' books? The following prompts us rather to suppose that Archimedes took the comparison of Eudoxus and Democritus from Eudemos' *History of geometry*:

- 1) It was characteristic of Eudemos' style to compare the results of several scientists who worked on the same problem.⁴⁹
- 2) The expression ἐξήγηρεν πρῶτος is also typical for Eudemos; it occurs in almost every fragment of his historical works.⁵⁰
- 3) Eudemos was concerned to specify whether a strict mathematical proof was given or not.⁵¹
- 4) In his *Physics*, Eudemos mentions Democritus (fr. 54a–b) and at one place he even addresses him in the vocative (fr. 75).
- 5) Eratosthenes, to whom the *Method* was addressed, certainly used Eudemos' work. This reinforces the possibility, implied by the passage from the *Quadrature of parabola*, that Archimedes too was acquainted with the *History of geometry*.

⁴⁷ II, p. 430.1ff. Heiberg = fr. 61c Lasserre. Cf. 68B155 DK.

⁴⁸ I, p. 4.5f. Heiberg = fr. 62b Lasserre.

⁴⁹ Frr. 139–40, 146; *Schol. in Eucl.* p. 654.3f. Heiberg; Pappus, p. 63.

⁵⁰ See below, n. 158.

⁵¹ Cf. his remarks on Thales: fr. 135; Procl. *In Eucl.* p. 157.10f., 250.20f.; Heath (1921) vol. 1, p. 130f.

If my assertion is right, we can add Democritus to the list of the mathematicians named by Eudemus. An absence of his name in Proclus' *Catalogue*, which appeared rather strange to many historians of mathematics,⁵² could be due to the Neoplatonic editing of this text.

An attempt to attribute to Eudemus mention of all the significant mathematicians before Euclid is justified not in the least by the fact that practically every mathematician that is known to us from the times of Thales to the second third of the fourth century *does* appear in Eudemus' fragments and in the evidence that can be safely attributed to him (including the *Catalogue*). More than that: from the other sources we do not know of *any* mathematician of that period who would not be mentioned by Eudemus (except for Hippasus and Democritus). Some of them, e.g., Mamercus, Neoclides, Leon, Theudius, Athenaeus and Hermotimus are known *only* from Eudemus. This appears to be a sufficient ground for further attempts to connect with his works those names as well, which for various reasons are omitted in the *Catalogue* (if, indeed, we have independent and reliable evidence on them).

On the other hand, this very fact prompts us to examine the chronology of the mathematicians *not* mentioned by Eudemus. In Proclus we find several references to a certain Amphinomus, taken from the mathematical encyclopedia of Geminus.⁵³ In one case, he associates Amphinomus with Speusippus, opposing them to the mathematicians of Menaechmus' school (p. 77.16f.); in the other, on the contrary, he writes about the mathematicians from the circle of Menaechmus and Amphinomus (p. 254.3f.). In all the references to Amphinomus specific mathematical discoveries are not in question; rather methodological debates and problems of terminology. This seems to be a sufficient reason for omitting Amphinomus in the *History of geometry*. After all, Speusippus and Xenocrates, who wrote a lot on these subjects, do not appear in this book either. There is, however, another possibility: Amphinomus worked after Eudemus had finished his book. This would make him a younger contemporary of Menaechmus, whose generation is the last to appear in Eudemus. According to Geminus, Amphinomus held the view that mathematics does not investigate the causes, while the originator of this view was Aristotle (p. 201.11). This might imply

⁵² Tannery (1882) p. 172; van Pesch p. 82; Heath (1927) p. 36; van der Waerden (1956) p. 150.

⁵³ In *Eucl.* p. 77.16f., 202.11, 220.9, 254.3f.; cf. Tannery (1887) p. 24; van Pesch p. 112f. On Geminus see below, p. 282.

that Amphinomus lived after him. To be sure, Geminus (or his source) was not interested in chronology and could associate the persons according to the similarity of their views, regardless of when they lived.⁵⁴ One more reference of Proclus, likewise taken from Geminus, concerns a certain Zenodotus, "who belonged to the succession of Oenopides, although he was a pupil of Andron" (p. 80.15f.). The mathematicians Zenodotus and Andron are otherwise unknown, while Oenopides of Chios was an older contemporary of Hippocrates. But did Geminus really have in mind that Oenopides? Again, he speaks here about the distinction between theorems and problems; their definitions given by Zenodotus are very close to those of Posidonius and his followers (p. 80.15f.). It seems, then, that Oenopides, Zenodotus, and Andron belong to the Hellenistic period.⁵⁵

3

Moving from the evident cases to the less evident, we come to one of our central problems: Who was the author of the *Catalogue of geometers* and how did this document come to Proclus?⁵⁶ It is customary since the second half of the 19th century to think of the information in the *Catalogue* as going back, albeit through intermediaries, to Eudemus' *History of geometry* (fr. 133).⁵⁷ Although Proclus does not mention Eudemus in connection with the *Catalogue*, he refers to "those who wrote the history of geometry" before Euclid (p. 68.4). Besides, Eudemus' fragments, including those quoted by Proclus himself, coincide thematically with the *Catalogue*: they tell us about the development of mathematics from the sixth to the fourth century (fr. 134–41).

⁵⁴ Cf. Lasserre (1987) p. 149f., 587f. Knorr (1986) p. 75 was indecisive about Amphinomus' chronology.

⁵⁵ Cf. Knorr (1986) p. 374 n. 70. Since Geminus' methodological discussion of theorems and problems (*In Eucl.* p. 77.7–78.10 and 80.15–81.4) is based on Posidonius (see fr. 195 Edelstein-Kidd with commentary), the other references to Amphinomus, Speusippus, Menaechmus, Oenopides, Zenodotus, and Andron might derive from the same source. Cf. Lasserre (1987) p. 552f., 614f. and 20F17–23. A Stoic Oenopides is mentioned in Aëtius (I.7.17). See: Zeller, p. 48 n. 1.

⁵⁶ This section partly overlaps with my recent article, where I have treated this subject in more detail: Zhmud (1998) p. 219ff.

⁵⁷ It was suggested first in 1866 by his editor L. Spengel. See also Tannery (1882) p. 171ff.; van Pesch p. 80: "*Inter omnes viros doctos constat originem id ab Eudemi historia duxisse.*"

However, in the last decades this *opinio communis* has been challenged, especially after the publications of the *History of the Academy* by Philodemus (first century BC), formerly known as the *Index academicorum*. In column Y of the Herculaneum papyrus 1021, which contains a part of Philodemus' book, we read the following:

At this time the mathematical sciences were also greatly advanced, with Plato being the architect of this development; he set problems to the mathematicians, who in turn eagerly studied them. In this way, μετρολογία (the theory of proportions?) and the research on definitions reached their peak, as Eudoxus of Cnidus and his students completely revised the old theory of Hippocrates (of Chios). Especially great progress was made in geometry, as the methods of analysis and of diorism were discovered. Optics and mechanics also were not (left in contempt?) . . .⁵⁸

The name of the author of this passage, taken by Philodemus from some early source, is omitted in the papyrus, and several theories have been proposed about his identity. Lasserre suggested that the passage comes ultimately from the book Περὶ Πλάτωνος by Plato's secretary Philip of Opus,⁵⁹ whereas Gaiser argued in favor of the Peripatetic Dicaearchus.⁶⁰ Lasserre's suggestion was supported by Burkert and Dorandi,⁶¹ and it seems to be much more plausible than Gaiser's.⁶² Whoever wrote this passage certainly belonged to the Academy, since only an Academician could have ascribed to Plato such an important role in the development of mathematics. On the other hand, the passage from Philodemus closely matches the description of Plato given in the *Catalogue*:

Plato [. . .] greatly advanced mathematics in general and geometry in particular because of his zeal for these studies. It is well known that his writings are thickly sprinkled with mathematical terms and that he everywhere tries to arouse admiration for mathematics among students of philosophy.

⁵⁸ For the text see Gaiser p. 152; Dorandi (1991) p. 126f. It is worth mentioning that the occurrence of mechanics in the passage that praises Plato's achievements destroys all the attempts of Plutarch to ascribe to him a contemptuous approach to this science (*Marc.* 14.9–11; *Quaest. conv.* 718E–F).

⁵⁹ Lasserre (1987) 20F15a–15b, p. 611ff.

⁶⁰ Gaiser p. 76f., 97f., 342ff.

⁶¹ Burkert (1993) p. 26f.; Dorandi (2001).

⁶² To judge from the preserved fragments of Dicaearchus (fr. 42, 43, 44, 71 Wehrli), he had a quite critical opinion of Plato. See also Philodemus, col. VI; Burkert (1993) p. 26f.

whereas Philip is described here as one of those “academic mathematicians” who studied mathematics under Plato’s methodological direction:

Philip [. . .] of Mende, a pupil whom Plato had encouraged to study mathematics, also carried on his investigations according to Plato’s instructions and set himself to study all the problems that he thought would contribute to Plato’s philosophy.⁶³

Against the background of Eudemos’ fragments and the other sections of the *Catalogue*, both these passages look rather odd. Eudemos records everywhere specific discoveries and achievements of the Greek geometers, but in these two passages there is not a single word about any discovery. It is hard to believe that Eudemos considered Philip’s foremost merit in mathematics to be that he studied problems connected *as he thought* with Platonic philosophy. And was it really relevant for Eudemos’ history of geometry that Plato’s writings were “thickly sprinkled with mathematical terms”? In this connection, the following question arises: Does it follow, as Lasserre thought, that we should credit Philip, instead of Eudemos, with the second part of the *Catalogue* — which begins with Plato and ends with Philip himself — if not with the *Catalogue* in its entirety?⁶⁴

I believe that there are no grounds for such a conclusion. First, it is far from evident that Philip was the author of the papyrus passage and that it was taken from his book *Περὶ Πλάτωνος*, of which we know virtually nothing. Hermodorus of Syracuse, another student of Plato, may well have been its author.⁶⁵ Besides *Περὶ μαθημάτων*,⁶⁶ he also wrote a work *Περὶ Πλάτωνος*.⁶⁷ Philodemus mentions his book on Plato (col. VI), so it must have been available to him. Further, there are two other Academicians who shared Philip’s and Hermodorus’ interests in mathematics and in Plato’s biography. Xenocrates was the author of *Περὶ τοῦ Πλάτωνος βίου*⁶⁸ and many works on mathematics.⁶⁹

⁶³ In *Eucl.* p. 66.8f., 67.23f., tr. G. Morrow.

⁶⁴ Lasserre (1987) p. 611ff. Earlier he shared a traditional view on the *Catalogue*: Lasserre (1966), fr. 22.

⁶⁵ Lasserre (1987) p. 433f. considered Hermodorus only an intermediary figure between Philodemus and Philip.

⁶⁶ D.L. 1.2 and 8 = fr. 6 Isnardi Parente.

⁶⁷ Frr. 7–8 Isnardi Parente = *FGrHist* 1008F2a–b.

⁶⁸ Frr. 264–66 Isnardi Parente = *FGrHist* 1010F1a–c.

⁶⁹ *Περὶ τῶν μαθημάτων*, *Περὶ γεωμετρῶν*, *Περὶ ἀριθμῶν*, *Περὶ ἀστρολογίας*,

Speusippus wrote Πλάτωνος περίδειπνον⁷⁰ that was known to Philodemus,⁷¹ as well as the Μαθηματικός and Περί τῶν Πυθαγορικῶν ἀριθμῶν.⁷² Since Philodemus apparently did not have any difficulties in finding the fourth-century sources, it is very hard to decide who authored the passage he cited.

Second, the *Catalogue* contains too much detailed information that has no connection with Plato, especially in its first part which narrates the development of geometry from Thales to Hippocrates and coincides with Eudemus' fragments. To be sure, Plato occupies a central place in the second part of the *Catalogue* and such a perspective brings it closer to the papyrus passage. But in spite of some similarities between the papyrus passage and the *Catalogue*,⁷³ the latter has a number of features that prevent us from suggesting a common origin for both texts. To say nothing of the first part of the *Catalogue*, even the perspective of the second part is much wider than that of the Philodemus passage, which is continued further with a polemic against certain students of Plato who used "the fruits of learning" for their own purposes. Although the end of column Y is in a very damaged state, and Gaiser's restoration of what follows after "optics and mechanics" is only tentative,⁷⁴ nothing that is discernible here implies that this quotation comes from a work on the history of mathematics. This work clearly focuses on Plato, and the passage on the progress of μαθήματα appears to be just a digression, intended to show that his influence has reached this sphere too.⁷⁵

Περί γεωμετρίας, Ἀριθμῶν θεωρία (D.L. IV.13–14).

⁷⁰ This work might be the same as his Πλάτωνος ἐγκώμιον (fr. 1 Tarán = *FGrHist* 1009T2–3, F1–3).

⁷¹ Col. VI and Pap. Herc. 164, fr. 12. See Gaiser p. 185, 441f.; Dorandi (1991) p. 178.

⁷² D.L. IV.5; fr. 28 Tarán.

⁷³ E.g., the references to Eudoxus who "applied the method of analysis to the theory of the section, which originated with Plato" (p. 67.6), and to another geometer, Leon, who discovered the method of diorism (p. 66.20). Cf. below, n. 96.

⁷⁴ Gaiser p. 153.

⁷⁵ In the same direction points the beginning of citation: [κατε]νένοητο καὶ τῶν μαθημάτων ἐπίδοσις πολλή κατ' ἐκείνον τὸν χρόνον. The motif of the rapid development of the exact sciences is known from Aristotle's *Protrepticus*: ἐν ὀλίγῳ χρόνῳ τοσαύτην ἐπίδοσιν τὴν τῶν μαθημάτων θεωρίαν λαβεῖν (fr. 5 Ross = fr. C 52:2 Düring); τοσούτον δὲ νῦν προεληλύθασιν ἐκ μικρῶν ἀφορμῶν ἐν ἐλαχίστῳ χρόνῳ ζητοῦντες οἱ τε περὶ τὴν γεωμετρίαν καὶ τοὺς λόγους καὶ τὰς ἄλλας παιδείας, ὅσον οὐδὲν ἕτερον γένος ἐν οὐδεμίᾳ τῶν τεχνῶν (fr. 8 Ross = fr. C 55:2 Düring).

Third, although Plato could not have been a reference point in Eudemus' history of fourth-century geometry, he could play such a role both for the early Academicians and for the Neoplatonists. Thus, it is possible to come up with the following alternatives: either the *Catalogue* was taken from a book by one of Plato's students and does not have any connection with Eudemus, or it was compiled on the basis of Eudemus' writing and its Platonic features are explained by later Neoplatonic editing. The second alternative seems to me preferable, since the traces of such editing are discernible as well in the first part of the *Catalogue*, e.g., in the section where a discovery of the five regular solids is ascribed to Pythagoras (p. 65.15f.) and typically Neoplatonic terms occur (ἀύλως, νοερῶς). Also the reference to the late pseudo-Platonic dialogue *Anterastai* (p. 66.3) can belong neither to Philip, nor to Eudemus. Further, if the *Catalogue* goes back to the same text as Philodemus' quotation, he must have known this text. Meanwhile, in his list of Plato's students (col. VI) only two of the twelve mathematicians of the fourth century, listed in the *Catalogue*, are named: Amyclas of Heraclea (who, however, is called here Amyntas) and Archytas, whereas Philip is inexplicably missing! Both of these names also occur in the source of Diogenes Laertius' list of Plato's students and can thus be traced back to a common tradition that has no connection with the *Catalogue*, where Archytas is *not* called Plato's student.⁷⁶

When analyzing the *Catalogue* many have overlooked the fact that the Platonizing tendency in this text does not end with Philip, but includes Euclid as well. Proclus, once again uniting all the previous mathematicians around Plato, says:

Euclid was younger than οἱ περὶ Πλάτωνα . . . , but belonged to his school and had an excellent knowledge of his philosophy, and he even set the final goal of the *Elements* as the construction of the five Platonic bodies (p. 68.17f.).

For simple chronological reasons, this description could come neither from Eudemus nor from any of Plato's students. It is, however, so similar to Philip's description that the two passages might appear to have

⁷⁶ Diogenes' list (III.46) probably goes back to Plato's biography written by Theon of Smyrna (Gaiser p. 439f., 444). Theon's list, preserved in Arabic, contains both Amyclas and Archytas, whereas in Diogenes Archytas is omitted, since he belonged to the Pythagorean school, and not to the Academy.

been written by the same hand. Both mathematicians worked under Plato's guidance (although in Euclid's case this guidance was indirect), and for both Platonic philosophy was the final goal in mathematics. This similarity proves again that the whole historical digression in Proclus' second introduction was subjected to Platonizing editing *after* the fourth century.

In a paper devoted to the *Catalogue*, Eggers Lan also notes many passages where Neoplatonic influence is clearly observed, but this leads him to completely different conclusions: the *Catalogue* was compiled by Proclus himself and besides two or three references it does not go back to Eudemus, either directly or indirectly.⁷⁷ To be sure, in addition to all the aforesaid, the late composition of the *Catalogue* is evident from the fact that, besides Euclid, it mentions Archimedes and Eratosthenes. This, however, does not mean that we should exclude Eudemus from its main sources. Even if we had not known about his *History of geometry*, we would have to infer the existence of such a work, proceeding from the detailed information of the *Catalogue* on mathematics of the 6th–4th centuries and precise chronological indications. The very fact that it contains many of the mathematicians' names, practically unknown to us from the other sources, suggests its early origin. Where, if not in Eudemus, could a later author get the information that Neoclides was younger than Leodamas (p. 66.18), and that his student Leon was a little older than Eudoxus (p. 67.2), if Neoclides and Leon are not mentioned elsewhere?

Considering Eudemus as the main source of the *Catalogue*, the scholars differently replied to the question whether his *History of geometry* was available to Proclus and whether Proclus himself could have been the editor of the *Catalogue*. Whereas Tannery denied both propositions, van Pesch and Heath were inclined to the following conclusion: although Proclus probably had access to Eudemus' book (as later did Simplicius and Eutocius)⁷⁸ he did not compile the *Catalogue*, but took it from an earlier source.⁷⁹ Both van Pesch and Heath emphatically denied Tannery's idea that Posidonius' student Geminus was an editor of the *Catalogue* and an intermediary between Eudemus and Proclus.⁸⁰ In fact, nothing that we know about Geminus and his work

⁷⁷ Eggers Lan p. 154ff.

⁷⁸ Cf. above, n. 3.

⁷⁹ van Pesch p. 84; Heath (1927) p. 37f.

⁸⁰ Tannery (1882) p. 172ff.; Tannery (1887) p. 71ff.

Μαθημάτων θεωρία⁸¹ suggests him as a source of either Neoplatonic influence in the *Catalogue* or its special interest in those predecessors of Euclid who compiled *Elements*.⁸² Geminus' work was devoted to the foundations of the exact sciences and to their classification; his main goal was to show the logical consistency of Euclid's mathematics and to refute its critique by the Sceptics and Epicureans.⁸³ There is no evidence that he was particularly interested in the history of mathematics before Euclid, or that he knew Eudemus' book.⁸⁴ One gets the same impression from his *Introduction to phaenomena*: clearly, the Eudemian *History of astronomy* was not used there.

Generally, one has to say that Tannery's arguments in favor of Geminus are so weak that it makes no sense even to repeat them.⁸⁵ Incidentally, apart from Geminus' encyclopedia there were three commentaries to the *Elements* among Proclus' sources: by Hero, Porphyry and Pappus. There is no point in discussing Hero as a Platonizing editor of Eudemus. Pappus, although he suits this role better than Hero,⁸⁶ does not mention Eudemus in his vast *Collectio* and only once in the commentary on book X of Euclid. Plato's name occurs only twice in the *Collectio*: first, in connection with the "nature of proportion" and second, concerning the so-called Platonic bodies.⁸⁷ Pappus was clearly too "technical" an author to be enthusiastic about Plato's contribution to geometry. As for the Neoplatonist Porphyry, he is the most appropriate

⁸¹ This title is given in Eutocius (*In Apoll. Con.* II, p. 170.25f. Heiberg), while Pappus refers to *Περὶ τῆς τῶν μαθημάτων τάξεως* (*Coll.* VIII, p. 1026.8f. Hultsch). Tannery (1887) p. 18f. and Tittel col. 1040f. were inclined in favor of the first title, Mansfeld (1998) p. 24 n. 21 — the second.

⁸² See van Pesch p. 80f.; Heath (1927) p. 37; Eggers Lan p. 140f.

⁸³ Tittel col. 1040ff. The same was characteristic of his teacher Posidonius (frs. 46–47, 195–99 Edelstein-Kidd).

⁸⁴ Tittel col. 1048 thought that Geminus knew Eudemus through Eratosthenes, but in this case Eratosthenes becomes the editor of the *Catalogue*. The only mathematician of the fourth century mentioned in that part of Proclus' commentary which can be safely attributed to Geminus (see: van Pesch p. 112ff.) is Menaechmus, the older contemporary of Euclid. In two cases methodological debates and terminology are in question (*In Eucl.* p. 72.24f., 78.9f, 78.17f.), and only once he refers to Menaechmus' discovery of the conic sections (p. 111.21). But even here his authority is Eratosthenes' epigram, and not Eudemus. About the earlier mathematicians he says nothing. Cf. above, n. 55.

⁸⁵ Tannery (1887) p. 71f., cf. van Pesch p. 81f.

⁸⁶ On Neoplatonic influence on Pappus see Mansfeld (1998) p. 99ff.

⁸⁷ III, p. 86.19f., V, 352.11f. Hultsch.

option for the role of an intermediary-editor. Actually, Tannery too considered this option, but then rejected it in favor of Geminus.⁸⁸ Such a decision was largely affected by his own, rather mechanical division of the “spheres of influences” between Porphyry and Geminus. Tannery believed that Geminus is mostly presented in the first part of Proclus’ commentary, where the *Catalogue* is located, and Porphyry in the second. Yet this picture is far from being correct: in both introductions to the commentary there is material both from Geminus and from Porphyry.⁸⁹ What makes Porphyry the preferable candidate?

- 1) Proclus in his *Commentary* five times refers to Porphyry’ work that was, in all probability, a commentary to Euclid.⁹⁰ Such a commentary, written by the Neoplatonist Porphyry, could explain both the Platonism of the second part of the *Catalogue* (as well as of some portions of the first part) and its interest in the predecessors of Euclid.
- 2) Proclus twice refers to Eudemus immediately after Porphyry, the first time in the space of one page (p. 297.4–298.10 and 299.3, on prop. XIV and XV), and the second time in the very same line (p. 352.14, on prop. XXVI). This reinforces the probability that Porphyry’s commentary included references to Eudemus’ book (in both cases theorems of Thales are in question).⁹¹
- 3) Porphyry was the author of a commentary to Ptolemy’s *Harmonics* that preserved the only fragment from Eudemus’ *History of arithmetic* (fr. 142).

⁸⁸ Tannery (1882) p. 171f.

⁸⁹ Proclus refers to Porphyry’s Συμμικτὰ ζητήματα in the same second introduction (p. 56.24), where the *Catalogue* is located. To be sure, direct references do not give an adequate picture. In the first introduction Proclus extensively borrows from Iamblichus’ *De communi mathematica scientia*, but he nowhere mentions his name in the entire *Commentary*. See Mueller (1987b).

⁹⁰ *In Eucl.* p. 255.12–14, 297.1–298.3, 315.11–316.13, 323.5–326.5, 347.20–352.14 = frs. 482–86 Smith. See Tannery (1882) p. 170f.; van Pesch p. 127f.; Heath (1921) vol. 2, p. 529; (1927) p. 24; Mansfeld (1998) p. 24. On the influence of Porphyry’s commentary on Proclus, see Mueller (1987a) p. 311f.

⁹¹ It is possible that Proclus took these two citations of Eudemus not directly from the *History of geometry* (as was the case with the other excerpts), but from Porphyry. It is equally arguable, however, that Porphyry’s references prompted Proclus to look in Eudemus’ book. Simplicius too used Eudemus’ book both directly and indirectly, through Alexander’s paraphrase (fr. 140). See Knorr (1987) p. 29ff.

- 4) The passage from the *Catalogue* relating to Pythagoras (p. 65.15f.) contains, on the one hand, Neoplatonic terms and, on the other, partly coincides with the passage from the work by Porphyry's student Iamblichus.⁹² In the same work of Iamblichus there is a short mention of Theodorus and Hippocrates (p. 77.24f. Festa), missing in the parallel passage of his biography of Pythagoras (VP 89). This remark is very similar to that place in the *Catalogue* where both mathematicians are also mentioned in one sentence (p. 66.4f.). It looks as though Iamblichus used the same source as Proclus,⁹³ i.e., Porphyry. To the same source must go back Iamblichus' information on the development of the theory of means from Pythagoras to Eratosthenes.⁹⁴
- 5) Porphyry wrote a history of philosophy that embraces practically the same period as the *Catalogue*: it starts from the Oriental predecessors of philosophy; covers Thales, Pythagoras and other Presocratics; and ends with Plato.⁹⁵ Porphyry clearly viewed Plato's system as the *telos* of the whole previous philosophy, and this attitude seems to be very close to the "Platocentrism" of the second part of the *Catalogue*, where the construction of the five Platonic bodies is called "the final goal of the whole *Elements*" (p. 68.18f.). This provides additional support to the hypothesis that Porphyry was the principal intermediary between Eudemus and Proclus.⁹⁶

To sum up, we find in Porphyry exactly what is missing in Geminus that would have enabled us to consider him the editor of the *Catalogue*: predisposition to Platonism, obvious knowledge of Eudemus' works,

⁹² *De comm. math. sc.* p. 70.1f. Festa. See: Burkert (1972) p. 410.

⁹³ Björnbo col. 1782; Burkert (1972) p. 458 n. 59. In Iamblichus' passage there are two examples of the "progressive" terms (ἐπιδιδόναι and προαγαγεῖν), so characteristic of the *Catalogue*. See below, n. 151.

⁹⁴ See above, p. 271. The latter is mentioned at the very end of the *Catalogue* (p. 68.18–20).

⁹⁵ φιλόσοφος ἱστορίᾳ ἐν βιβλίοις δ' = fr. 193–224 Smith. Apart from the fragments, only one part of the first book is preserved, containing the biography of Pythagoras.

⁹⁶ Porphyry might have derived additional information from the same work as Philodemus, which would explain certain similarities between the *Catalogue* and column Y. It is noteworthy that he knew, although indirectly, Hermodorus' book *On Plato* (fr. 7–8 Isnardi Parente = *FGrHist* 1008F2a–b = fr. 146 Smith).

interest in the intellectual history of the 6th–4th centuries in general and in Euclid's predecessors in particular. This seems to be a sufficient ground to think that we owe to Porphyry the present form of the *Catalogue*, i.e., a very abridged and tendentiously revised version of the *History of geometry*. Following Eudemus' chronological exposition, he compiled a short outline of geometry from Thales to the immediate precursors of Euclid and used it as a historical introduction to his commentary on the *Elements*. It is conspicuous that as soon as Porphyry leaves Eudemus' text and turns to Euclid, he begins to lack the reliable historical data. An absence of Eudemus' followers in the Hellenistic period made it very problematic for Porphyry to figure out even a rough date for Euclid: he had to rely on casual remarks of Archimedes and Eratosthenes, and on historical anecdotes (p. 68.10f.). What a contrast with Eudemus' chronologies, which are precise almost to the decade!

It would be mistaken to think, however, that the final version of the *Catalogue* is due to Porphyry. Specifically, the passage that ascribes to Pythagoras the discovery of irrationality and of the five regular solids (p. 65.15f.) can likely be attributed to Proclus.⁹⁷ At any rate, we do not find this information in the parallel passage in Iamblichus (*De comm. math. sc.*, p. 70.1f.) nor in his other works. Meanwhile, "Panpythagoreanism" is much more characteristic of Iamblichus than of Proclus, so if he had known this tradition, either from Porphyry or from elsewhere, he would have certainly mentioned it. While the version referring all the regular solids to Pythagoras is known before Proclus,⁹⁸ the idea that he was the author of the theory of irrationals (τῶν ἀλόγων πραγματεία) is not attested in any other ancient source. In this connection it was proposed long ago to change the reading τῶν ἀλόγων πραγματεία into τῶν ἀνὰ λόγων πραγματεία, i.e., into the theory of proportions.⁹⁹ This reading, however, is attested only in one manuscript, all the others have τῶν ἀλόγων πραγματεία.¹⁰⁰ To judge from Iamblichus' passages that connect Pythagoras with the first three means,¹⁰¹ Porphyry and, correspondingly, Eudemus wrote about τῶν ἀνὰ λόγων πραγματεία. It is confirmed both by Nicomachus and by the obvious fact that Pythagoras really dealt with proportions. What

⁹⁷ Cf. Burkert (1972) p. 411f.

⁹⁸ Aët. II.6.5 = 44A15; Burkert (1972) p. 70 n. 113.

⁹⁹ DK I, p. 98.23; Heath (1921) vol. 1, p. 84f.

¹⁰⁰ I discussed this passage in Zhmud (1997) p. 158f.

¹⁰¹ See above, p. 271.

made Proclus change the "theory of proportion" into the "theory of irrationals"?

I suppose he did it for the same reason he is silent about Hippasus, one of the important mathematicians of the early fifth century. Late tradition connects with Hippasus two significant discoveries: the construction of the dodecahedron inscribed in the sphere and the discovery of irrationals. One part of the evidence (Clemens of Alexandria, Iamblichus) mentions Hippasus' name, the other speaks about some anonymous Pythagorean.¹⁰² At least two pieces of evidence from the last group, which concern the discovery of irrationality, are based on Eudemos: Pappus' commentary on book X of Euclid and the scholia to the same book.¹⁰³ To them we should add the first scholium to book XIII that relates to the Pythagoreans the discovery of the first three regular solids, including the dodecahedron. Does it follow from this evidence that Eudemos has referred to some anonymous Pythagoreans, and the late tradition filled in Hippasus' name? If so, we are not in a position to determine who in fact was the author of these discoveries. Besides, it means that Hippasus totally disappears from the history of mathematics, since no other discoveries are ascribed to him. In other words, if Eudemos and his contemporaries had not known the mathematician Hippasus, he did not exist.

Meanwhile, Hippasus was known as a philosopher to Aristotle and Theophrastus;¹⁰⁴ Aristoxenus referred to his acoustical experiment, based on mathematical proportions;¹⁰⁵ Iamblichus, relying on the tradition that most likely derives from Eudemos, likewise connected his name with the first three proportions.¹⁰⁶ Thus, the Pythagorean Hippasus who took up philosophy, harmonics, and mathematics did not merely exist but was known at the end of the fourth century. On the other hand, Eudemos mentioned the discovery of the irrationals and the construction of the dodecahedron by the Pythagoreans. I believe, therefore, that the late tradition assigning these discoveries to Hippasus, contains a historical core and might go back to Eudemos. If, however,

¹⁰² The evidence and its analysis, see Zhmud (1997) p. 170ff.

¹⁰³ Pappus, p. 63f.; *Schol. in Eucl.* p. 415.7, 416.13, 417.12f. Heiberg. See above, n. 27.

¹⁰⁴ Arist. *Met.* 984a7; Theophr. fr. 225 FHS&G, cf. Aët. I.3.11, IV.3.4 = 18A9.

¹⁰⁵ Fr. 90 Wehrli, cf. 18A13. See above, n. 32.

¹⁰⁶ *In Nicom.* p. 100.23, 113.17, 116.4 Pistelli. See above, p. 271f.

Eudemus named Hippasus, why then is his name missing from the *Catalogue*? There is at least one important ground for such an omission. Proclus, unlike Eudemus, attributed to Pythagoras these very discoveries that the late tradition connects with Hippasus: the theory of the irrationals and the construction of all five regular solids, including the dodecahedron. Therefore, for the mathematician Hippasus there was no place left in the *Catalogue*. One might surmise that Proclus had decided to trust the tradition that persistently connected Hippasus with plagiarism and with divulging of the Pythagorean secrets¹⁰⁷ and to sacrifice this figure by “returning” his discoveries to Pythagoras.¹⁰⁸

4

Eudemus’ history of the exact sciences has to be considered against the background of other historical genres that were initiated or cultivated in the Lyceum. Aristotle himself compiled lists of the Olympian and Pythian victors, of the dramatic victors at the Dionysia,¹⁰⁹ and wrote a number of other writings of a historical character.¹¹⁰ Besides cultural history and philosophical doxography, developed by Aristotle,¹¹¹ and after him by Dicaearchus (Βίος Ἑλλάδος) and Theophrastus (Φυσικῶν δόξαι), a new genre, the biography, was founded by Aristoxenus and Dicaearchus. Being fully aware of the historical character of such human accomplishments as the state, art, philosophy or science, Aristotle tried to reveal the inner logic of their development. Even if Aristotle does not entirely meet the *modern* re-

¹⁰⁷ This tradition is presented in Iamblichus’ work that Proclus certainly used (*De comm. math. sc.* p. 77.18f. Festa, cf. *VP* 88, 246–47).

¹⁰⁸ The motives of Pappus’ silence can be more prosaic: he was not very concerned about mentioning the names of the mathematicians. While Nicomachus says that the first three means “came down to Plato and Aristotle from Pythagoras” (*Intr. arith.* p. 122.11f.), Pappus quoting him omits all the names (*Coll.* III, p. 84.1f. Hultsch). This is not the only example: in the fourth book of the *Collectio* Pappus presents three methods of angle trisection without any attribution. On Pappus’ method, see Knorr (1989) p. 227ff.

¹⁰⁹ D.L. V.26, Nr. 130–31, fr. 615–17 Rose = fr. 408–14 Gigon; D.L. V.26, Nr. 135.

¹¹⁰ See, e.g., his dialogue *On poets* (fr. 70–77 Rose = fr. 14–22 Gigon), where much attention is paid to the founders of the different genres, and especially his history of rhetoric in *Τεχνῶν συναγωγή* (fr. 136–41 Rose = fr. 123–34 Gigon). Cf. De Ste. Croix p. 29 with further references.

¹¹¹ On Aristotle’s doxography, see Mansfeld (1990) p. 28ff.

quirements of history, he did much more for its development than any ancient philosopher.¹¹² Therefore, it is difficult to agree with the views that he held history in very low regard, because it deals *only* with the particular,¹¹³ or that history (including intellectual history, the history of ideas and of philosophy) interested Aristotle not *per se*, but only as material for dialectical discussion in the course of developing his own theories.¹¹⁴

We can better understand what value the Peripatetics did assign to historical research, if we remember that Aristotle's theory of science stresses the empirical origin of any knowledge. The question of ὅτι (collection and description of the facts) precedes and makes possible the question of διότι (explanation of the general or particular causes). Any scientific explanation must be based on the previously arranged relevant facts.¹¹⁵ In this way, even purely descriptive work is a legitimate and necessary part of scientific procedure, if it presupposes subsequent theoretical analysis, and the Peripatetics wrote, as we know, hundreds of such works. It seems very probable that the entire historiographical project, conceived by Aristotle, i.e., Eudemus' histories of the exact sciences and his history of theology, Theophrastus' "physical" doxography, and Menon's medical doxography, set as a general task the collection, systematization and at least preliminary analysis of evidence for subsequent philosophical examination. It is conspicuous, further, that the study of the different fields of knowledge was distributed among Aristotle's students according to his division of theoretical sciences into mathematics, physics, and theology.¹¹⁶ This corresponds

¹¹² See von Fritz (1956).

¹¹³ Zoepffel p. 37: "so ist Historia in ihrem Bereich, vom philosophischen Standpunkt aus betrachtet, kein wirkliches Wissen." Cf. De Ste. Croix p. 29: Aristotle "evidently saw research into historical facts as a necessary condition, though not of course a sufficient condition, of full scientific knowledge of human society."

¹¹⁴ Baltussen, e.g., suggests that Aristotle was not a historian *sensu stricto* and that we can hardly regard him and his followers as historians in the modern sense of the word (p. 335f.). This is of course correct, yet is "a historian in the modern sense of the word" the *only possible* kind of historian? What would remain of Jacoby's *Fragmente der griechischen Historiker*, if we apply to them modern conceptions of objective historical research? The Peripatetic way of doing the history of philosophy certainly was methodologically immature and subjective. Still, I do not think that the best way to study doxography is to isolate it from the other historical genres practiced in the Lyceum and to regard it as a part of Aristotle's dialectical procedure.

¹¹⁵ *An. Post.* 89b29, 93a16ff. See Kullmann p. 204ff.

¹¹⁶ *Met.* 1026a18ff., 1064b1ff.

quite well to Aristotle's common method and to his other project, the collection and the arranging of material for his *Politics*, in the course of which the 158 polities of the different Greek cities were written. They were also classified according to his theoretical scheme of the different types of power.¹¹⁷ It hardly needs reminding, however, that Aristotle's *Athenian polity* is a historical treatise of independent value, addressed to a wide audience, and not just a dossier. In fact, nothing suggests that Aristotle and his followers self-consciously limited their historical writings *only* to the question of facts and of particulars, trying to avoid any generalization.¹¹⁸ Modern historians will agree with Aristotle that history as such does not belong to the theoretical sciences, although there *are* some historical regularities that we can discern and study.¹¹⁹

What was the difference between the approaches of Eudemus, Theophrastus, and Menon to the various fields of knowledge within the framework of the Peripatetic project? How were Eudemus' writings arranged: chronologically, thematically or problematically? Is it appropriate to define them as a history of developing knowledge, or were they rather "a classification of the authors according to different mathematical topics"?¹²⁰ Let us begin from the titles of Eudemus' books.¹²¹ What, e.g., does the title Γεωμετρικὴ ἱστορία mean: "geometric inquiry," "inquiry into geometry" or "history of geometry"? It is clear that this book was not a mathematical treatise and that Eudemus was inter-

¹¹⁷ See the title: Constitution of 158 cities, according to the type, democratic, oligarchic, tyrannical, aristocratic (D.L. V.26).

¹¹⁸ Dicaearchus' Βίος Ἑλλάδος deals apart from particular events and individuals with the general stages of the development of civilization (fr. 47–51). At the beginning of his *History of geometry* Eudemus states a general rule of the cognitive evolution from αἰσθησις to λογισμός and further to νοῦς (fr. 133), and this is clearly not the only case of διότι. Two of Theophrastus' works, *Historia plantarum* and *De causis plantarum*, are devoted respectively to the research of ὅτι and of διότι. In *Historia plantarum* one finds, however, not merely assembled data but botanical classification, morphology, and taxonomy.

¹¹⁹ De Ste. Croix p. 24f. discusses in this connection an important Aristotelian concept, ὡς ἐπὶ τὸ πολὺ, "as a general rule." According to Aristotle, this kind of regularity along with the universal and the necessary also belongs to the theoretical ἐπιστήμη (*Met.* 1027a20–21, 1064b32–36, 1065a1–6).

¹²⁰ Eggers Lan p. 130.

¹²¹ They are given by several authors, the most exact variant being preserved by Simplicius: Γεωμετρικὴ ἱστορία (fr. 140), Ἀστρολογικὴ ἱστορία (fr. 148). Porphyry refers to Ἀριθμητικὴ ἱστορία (fr. 142).

ested not in geometrical problems themselves, but in the way they were solved by others. Thus, the subject of his study coincides with the subject of the history of science, as we understand it. That is why the titles of his works should be compared not so much with the notion *περὶ φύσεως ἱστορία*, reflected in the titles of Aristotle's and Theophrastus' works (*ἱστορία ζώων* and *περὶ φυτῶν ἱστορία*), but rather with that usage of *ἱστορία* which is attested already in Herodotus (VII.96) and is understood commonly as a "written account of one's inquiries, narrative, history."¹²² But even if Eudemus' book had been entitled simply *περὶ γεωμετρίας*,¹²³ or had no title at all, this would not have crucial importance for defining its genre. Although Thucydides' book had no title, and he never uses the word *ἱστορία* this does not prevent us from referring his book to the historical genre. The sentence already quoted from the *Catalogue*, οἱ τὰς ἱστορίας ἀναγράψαντες μέχρι τούτου προάγουσι τὴν τῆς ἐπιστήμης ταύτης τελείωσιν (p. 68.4) definitively shows that readers took Eudemus' book as a historical exposition of the development of geometry.

To be sure, for Aristotle and for the Lyceum in general *ἱστορία περὶ φύσεως* was not yet so strictly separated from *ἱστορία* of human πράξεις and γενόμενα as it is for us. Comparing the fragments that come from the books with the same title *Ἱστορικά ὑπομνήματα*, by Theophrastus (fr. 196A FHS&G), Aristoxenus (fr. 131) and Hieronymus of Rhodes (frr. 35–36), we can see that Theophrastus deals with "natural history," whereas the two other Peripatetics examine the historical (biographical) material.¹²⁴ A specific feature of human history

¹²² *LSJ*, s.v. II; Hornblower p. 9. On *ἱστορία* as "history" see: Arist. *Rhet.* 1359b30f., 1360a30–37; *Poet.* 1451b1–7, 1459a21–24; Anaximenes (*FGrHist* 72F3, 9). Ephorus, the older contemporary of Eudemus, gave the title *Ἱστορίαι* to his universal history. Theophrastus' student Praxiphanes criticizes Thucydides in his *Περὶ ἱστορίας* (fr. 18 Wehrli). The content of Theophrastus' work *Περὶ ἱστορίας* (D.L. V.47) is unknown.

¹²³ Cf. Aristoxenus' *περὶ ἀριθμητικῆς* (fr. 23 Wehrli) that also deals with the history of mathematics.

¹²⁴ It is worth noting that whereas *ἱστορία ζώων* was considered by Aristotle as "natural history," *περὶ φύσεως ἱστορία* was traditionally understood as "natural philosophy." This hardly justifies Zoepffel's idea that *ἱστορία* as *such* rules out any research into the general causes. At *De caelo* 268a1 *περὶ φύσεως ἱστορία* means the same as *περὶ φύσεως ἐπιστήμη* (298b2), and at *De an.* 402a4 *ἡ τῆς ψυχῆς ἱστορία* is characterized as a purely theoretical investigation (cf. Socrates' ironical narration about τῆς σοφίας ἦν δὴ καλοῦσι *περὶ φύσεως ἱστορίαν* that investigates τὰς αἰτίας ἐκάστου at Pl. *Phaedo* 96A). Quite consistently with this usage Theophrastus employs the notion

is that the chronological principle is the most natural and convenient way to systematize the facts (Arist. *Poet.* 1459a21–24), whereas in the *ἱστορία περὶ φύσεως* other principles of systematization are usually applied.

The subject of Eudemus' works was the development of the exact sciences from their origin to the second third of the fourth century. The last mathematicians he refers to in the *History of geometry* are Eudoxus' students. This corresponds to the chronological framework of his *History of astronomy* which starts from Thales (fr. 143) and ends with Eudoxus' student Callippus (fr. 149), Eudemus' own contemporary. The fact that in the *Catalogue* all the names of the geometers are given in chronological order, often with indications of who was older and younger, who was whose student, etc., also speaks to the historical character of Eudemus' writings.¹²⁵ Besides, we know that Eudemus considered the Pythagoreans in the first book of the *History of arithmetic* (fr. 142), the quadrature of lunes in the second book of the *History of geometry* (fr. 140), and the theories of Eudoxus and Callippus in the second book of the *History of astronomy* (fr. 148–49).

In the doxographic treatises of Theophrastus and Menon the material is arranged as a rule along different lines. They classified δόξαι not according to the chronology of their authors, but according to certain topics or problems, such as the nature of the moon's light or the causes of diseases. The same pattern of organization is to a large degree characteristic of the doxographic passages in Aristotle, where he discusses the ἀρχαί of his predecessors (*Met.* 1.3–7; *De An.* 1.2; *Phys.* 1.2–4). This pattern was originated by Hippias of Elis, Gorgias, Isocrates and others, who classified ideas on thematic or systematic principles, e.g., according to the character and/or number of ἀρχαί that were held by a philosopher.¹²⁶ We cannot say, however, that the Peripatetics blindly followed the schemes of the early doxography. Already Aristotle, and particularly Theophrastus tried to combine the systematic pattern with the chronological, by tracing the development of the ideas from teacher to student, from one school to another, etc.¹²⁷ These attempts to give,

περὶ φύσεως ἱστορία both to Thales' and to Plato' philosophy (fr. 225, 230 FHS&G). See also fr. 224 on Xenophanes.

¹²⁵ Heath (1927) p. 38.

¹²⁶ Mansfeld (1990) p. 55f.

¹²⁷ Ibid. p. 28ff. It is conspicuous especially in the first book of Φυσικῶν δόξαι (von Kienle p. 38f., 52f., 58f.).

at least partially, a historical dimension to the doxography were based on the idea, very important for Aristotle, of the gradual perfection of philosophy from its first immature ideas to the present state.¹²⁸ If the idea of development and the historical approach that follows from it were not applied consistently, it is because the systematic pattern answered much better the purposes of doxography and the material it dealt with.

Doxography aimed to describe *all* the (relevant) δόξαι, not merely the true ones; putting it another way, its subject was φυσικῶν δόξαι, and not φυσικὴ ἐπιστήμη. Furthermore, in the physical and medical theories studied by Theophrastus and Menon there were no hard proofs, and to separate the true δόξαι from the untrue was difficult. The ideas of the sixth-century thinkers often appeared to be more convincing than those of the more recent periods, thus they did not always fit the chronological pattern. As for Eudemus, he could employ an historical approach much more consistently than his colleagues mostly due to the character of his material. Indeed, at that time the cumulative development of the exact sciences was more manifest than that of natural philosophy or medicine. The discoveries of many mathematicians immediately depended on what was done before them: Hippocrates and Theaetetus relied on Pythagorean mathematics, Archytas and Eudoxus developed the theories of Hippocrates, etc. Progress in mathematics is all the more evident, because, according to Aristotle's concession, "it alone among human activities knows of proofs."¹²⁹ That is why a mathematician could base his research on a solid foundation created by his predecessors and move further in his quest for the truth. To be sure, Eudemus records some unsuccessful attempts to solve mathematical problems, e.g., that by Antiphon to square a circle (frr. 139–40). It lies, however, in the nature of mathematics that its history, more than that of any other science, lists a much larger number of victories than of failures.

And yet I would not exaggerate the dependence of Eudemus' approach on the material he was dealing with. Both his inclination to historical (or, at least, chronological) schemes and his interest in the history of ideas are revealed outside the exact sciences. In the *History of theology* he also names the *theologoi* according to their chronol-

¹²⁸ *Met.* 993a15–17; fr. 53 Rose; see below, p. 296f.

¹²⁹ Arist. ap. Iamb. *De comm. math. sc.* p. 78.8f. Festa. See Burkert (1972) p. 447f.

ogy.¹³⁰ In the fragments of his *Physics* there are unusually many doxographical digressions, presenting and/or criticizing the views of Parmenides, Zeno, Melissus, Anaxagoras, Empedocles, the Pythagoreans, Archytas, and Plato.¹³¹ The same names (except for Archytas) could be found in Aristotle's *Physics*, but Eudemus, it seems, pays much more attention to them.

Returning to the problem of how material was organized in Eudemus' history, I quote Wehrli's opinion: "Der Stoff war nach Auftreten und Entwicklung der maßgebenden Gedanken, nicht nach Autoren geordnet."¹³² To be sure, one and the same mathematician, e.g., Hippocrates, could appear in connection with the problem of doubling the cube (along with Archytas and Eudoxus) and in connection with the quadrature of the circle (with Antiphon). The same can be said about the Pythagoreans and Theaetetus, Democritus and Eudoxus, etc. But I still do not think that the thematic or problematic principle predominates in Eudemus. Such a principle is suitable for examination of how *different* mathematicians solved the *same* problem — e.g., the duplication of the cube — but it does not fit the historical study of whom a particular mathematical discovery belongs to. It is evident, at least, that such figures as Thales, Mamercus, Pythagoras and Oenopides were treated by Eudemus in connection with their discoveries. By the way, it is hard to call Oenopides' discoveries *maßgebende Gedanken*; Eudemus very likely referred to them only because he knew that it was Oenopides who made them. As to Mamercus, Eudemus scarcely knew more about him than that he was famous as a mathematician; such a figure could be mentioned only in a historical context. Eudemus appeared to deviate from the chronological principle only when he treated the problems that several mathematicians of different generations had worked on. But usually he moves from generation to generation, from teachers to stu-

¹³⁰ Fr. 150. With one exception: Acusilaus (ca. 500 BC) is mentioned after Hesiod, but before Epimenides and Pherecydes who are older than he. One reason for this might be that Acusilaus appears to follow Hesiod very closely in his *Genealogiai* (DK 9A4). This was explicitly mentioned by Plato (*Symp.* 178B = DK 9B2), on whom Eudemus could have relied. It could be also that Eudemus simply did not know the correct chronology of Acusilaus.

¹³¹ Fr. 31, 35–47, 49, 53–54, 60, 65, 67, 75, 78, 82, 89, 110–11, 118.

¹³² Wehrli p. 113; "problemgeschichtliche Anordnung," *ibid.* p. 119.

dents, as is seen in the *Catalogue*, and not from one problem to the other.¹³³

A few words about Eudemos' style. Simplicius twice notes the laconic and clear style of his *History of astronomy* (fr. 149) and in quoting a long passage from the *History of geometry* he refers again to Eudemos' memorandum-like style (fr. 140). It is interesting that Simplicius mentions the "archaic brevity" of his account at the very place (fr. 140, p. 59.26) where Eudemos himself was going to consider the problem in detail (fr. 140, p. 60.1). It seems, therefore, that in this case Eudemos simply reproduced Hippocrates' proofs, which were not sufficiently complete from Simplicius' point of view. In any case, we know that Eudemos did not confine himself to the abbreviated exposition of the material. Speaking about Thales' discoveries, he notes both his archaic terminology,¹³⁴ and whether the latter gave a scientific proof or not (fr. 135). At one point Eudemos even tries to "reconstruct" the theorem that he ascribes to Thales (fr. 134). Referring to the Pythagorean application of the areas, he emphasizes that this discovery was ancient (fr. 137), and his commentary on the quadrature of the circle contains a criticism of Antiphon (fr. 140).

Generally, one can say that Eudemos paid attention not only to the results and the form of their exposition but also to the method of the proof and whether it corresponded to what was customary in his own time. In the *Catalogue*, the perfecting of the geometrical methods is discussed in much detail. It is said here that Thales' method was in some cases more empirical, and in others more general, i.e., scientific (*In Eucl.*, p. 65.10), whereas Pythagoras is credited with the transformation of geometry into abstract science and its inclusion in the canon of higher education.¹³⁵ Owing to the efforts of Leodamas, Archytas, and Theaetetus geometry became "more scientific and systematic," while Leon discovered the method of diorism, Eudoxus used the method of

¹³³ Heath (1927) p. 38; Edelstein p. 95. Quite a different approach was characteristic of the later authors like Pappus or Eutocius. They could describe various solutions of the same problem ignoring either the chronology of their authors (Eutoc. *In Archim. De sphaer.* III, p. 57.13ff. Heiberg), or even their names (Papp. *Coll.* IV, p. 270.1ff. Hultsch); see Knorr (1989) p. 77ff., 213ff.

¹³⁴ *In Eucl.* p. 250.20f. See the similar note on Oenopides (*ibid.* p. 283.8).

¹³⁵ Cf. Arist. *Met.* 985b23f., *Protr.* fr. 18, 20 Düring; Aristox. fr. 23.

analysis, and his students Menaechmus and Dinostratus “made the whole of geometry still more perfect” (ἔτι τελεωτέραν ἐποίησαν τὴν ὅλην γεωμετρίαν). It is significant that the *Catalogue* starts with the words about the transition ἀπὸ τοῦ ἀτελοῦς εἰς τὸ τέλειον and ends with the notice that “those who compiled histories of geometry bring the perfecting (τελείωσις) of this science up to this point.” The idea of the “completion” of geometry at the end of the fourth century, i.e., before Euclid, Archimedes, and Apollonius, could not belong to any author later than Eudemus. This confirms once again that the beginning of the *Catalogue* also goes back to him.

I have suggested above that in his histories of the exact sciences Eudemus employed the professional approach, to the extent, of course, that it was possible for a Peripatetic philosopher. This does not contradict the fact that his views on development in general, and on development of science in particular, rely on the Aristotelian doctrine which can be tentatively called “teleological progressivism.” According to this doctrine, everything in nature, society and culture develops from a primitive state to a perfect one,¹³⁶ and for many things this state of perfection was thought to have already been achieved or almost achieved. So, tragedy has already “attained its very nature” (*Poet.* 1449a15), society has found its best and final state in the *polis* (*Pol.* 1252a26–1253a9), and philosophy, whose early ideas were as immature as childish speech (*Met.* 993a15–17), will be completed soon (fr. 53 Rose).¹³⁷ Against this background, Eudemus’ idea that geometry had achieved or almost achieved perfection seems quite natural.¹³⁸

To be sure, the epistemological optimism that Eudemus shared with his teacher was not exceptional in this period of classical rationalism. The author of the *Ancient medicine* was convinced: “what still remains undiscovered in medicine will be discovered” (*VM* 2), if the inquirer uses the right method. The other Hippocratics believed the whole of medicine to be already discovered,¹³⁹ and no less optimistic ideas were

¹³⁶ “There is evolution towards a state of excellence all over in the design of nature; the goal is the end, *telos*,” Burkert (1997) p. 31.

¹³⁷ “Since in few years great progress has been achieved, philosophy will be finished and perfected in a short time.” Cf. his similar remarks on the arts (*EN* 1098a22f.) and political systems (*Pol.* 1264a3).

¹³⁸ Theophrastus expressed similar views: were men to live longer, the arts and sciences might be brought to perfection (fr. 34A FHS&G). See Edelstein p. 148 n. 31.

¹³⁹ *De locis in hom.* 46; *De arte* 1. See Jouanna p. 43f.

expressed by the poets of the fourth century.¹⁴⁰ Although these parallels do not cast doubt upon Eudemus' Aristotelianism, they show that he did not slavishly follow his teacher's ideas, but rather that both shared views common for that period.¹⁴¹ The same common attitude is seen in the thesis that all the sciences appeared due to their practical necessity, the Egyptians being the first to discover geometry (*In Eucl.*, p. 64.17). The author of the *Ancient medicine* also believed that medicine was discovered due to necessity and need.¹⁴² We find analogous notions on the origin of τέχνη in many classical writers.¹⁴³ The idea that geometry originated with the Egyptians has even more predecessors.¹⁴⁴ But whereas Eudemus follows Herodotus' view concerning the practical origin of Egyptian geometry and shares Philip's conviction that the Greeks bring to perfection all the knowledge they receive from the barbarians,¹⁴⁵ Aristotle points out that μαθηματικά τέχναι were first discovered in Egypt because the local priests were allowed to be at leisure (*Met.* 981b23). This remark clarifies the preceding passage, where he states that in every civilization practical τέχναι are born first, then appear the fine arts, and after them theoretical ἐπιστήμαι, for which, adds Aristotle, leisure time is needed.

It is noteworthy that the same historical scheme was known before Aristotle; some of his predecessors did notice the role of σχολή, whereas others did not.¹⁴⁶ It is possible therefore that in this case Eudemus followed the more simple version that occurs also in Aristotle.¹⁴⁷ The general line of the cognitive development from

¹⁴⁰ Chairemon: οὐκ ἔστιν οὐδὲν τῶν ἐν ἀνθρώποις ὅτι οὐκ ἐν χρόνῳ ζητοῦσιν ἐξευρίσκεται (*TGF* 71F21); Alexis: ἅπαντα τὰ ζητούμενα ἐξευρίσκεται (fr. 31 Kassel–Austin).

¹⁴¹ Cf. Isoc. *Paneg.* 10, *Nic.* 32, *Euag.* 7, *Antid.* 82, 185.

¹⁴² On the possible influence of Democritus or Protagoras, see Jouanna p. 34f., 45f.

¹⁴³ Democritus (68B144); Isocrates (*Bus.* 12–15, 21–23); Philip (*Epin.* 974D8f., 975C9f.); Aristotle (fr. 53 Rose = *Protr.* fr. 8 Ross; *Pol.* 1329b25f.; *Met.* 981b12–22, 982b22f.).

¹⁴⁴ Herodotus (II.109); Isocrates (*Bus.* 28, cf. 23); Plato (*Phaedr.* 274D1f.; *Leg.* 747A–C); Philip (*Epin.* 986D8ff., 987D9); Aristoxenus (fr. 23).

¹⁴⁵ κάλλιον τοῦτο εἰς τέλος ἀπεργάζονται (987E1) clearly corresponds to τελείωσις in Eudemus.

¹⁴⁶ Democritus (68B144), Plato (*Leg.* 677A–683B), and Philip (*Epin.* 974D3–977B8) do not mention σχολή. Cf.: Isocrates (*Bus.* 21–23), Plato (*Crit.* 110A).

¹⁴⁷ Fr. 53 Rose = *Protr.* fr. 8 Ross; *Pol.* 1329b25ff.

αἴσθησις to λογισμός and further to νοῦς, which is known from the *Catalogue* (p. 65.1f.) has quite obvious parallels in Aristotle.¹⁴⁸ In accordance with this scheme Eudemus stressed the practical *origin* of Egyptian geometry (but not its practical *character*), since even Thales, who borrowed this science (θεωρία) from Egypt, still proved some things αἰσθητικώτερον and others καθολικώτερον (p. 65.10). Thus, for Eudemus the real founder of theoretical geometry was not Thales, but Pythagoras (p. 65.15f.). In this opinion he hardly contradicts Aristotle, who writes in the same book of the *Metaphysics*: the Pythagoreans were the first to advance the mathematical sciences (985b23f.).

The idea of the progressive growth of mathematical knowledge pre-dates Eudemus, of course. In the *Protrepticus* Aristotle refers to significant progress being achieved in mathematics in a very short time.¹⁴⁹ In Philodemus' passage the term ἐπίδοσις, designating progress, is used twice: first, with regard to all mathematical sciences (τῶν μαθημάτων ἐπίδοσις πολλή κατ' ἐκείνον τὸν χρόνον), and second, in connection with geometry (ἔλαβε δὲ καὶ ἡ γεωμετρία πολλὴν ἐπίδοσιν). Although ἐπίδοσις appears only once in Eudemus¹⁵⁰ the verbs from the same semantic group as ἐπιδιδόναι (αὐξάνειν, προαγαγεῖν, προέρχεσθαι) occur in the *Catalogue* very frequently.¹⁵¹ Incidentally, the term ἐπίδοσις and its synonyms were not the only means to express the idea of the progress of knowledge. From the time of Xenophanes (21A18) this idea was connected with two key notions, ζήτησις and εὔρεσις.¹⁵² It is with these words that the author of the Hippocratic treatise *On ancient medicine* describes the origin and development of his τέχνη. In his view, the history of medicine is the history of the inquiries and discoveries that increase our knowledge about human nature and the causes of diseases (VM 2–4). This history begins with the πρῶτοι εὔρεταί, who discovered medicine itself.¹⁵³ The quest for

¹⁴⁸ *Met.* 981a12ff., *NE* 1139a17f. See: Wehrli p. 114.

¹⁴⁹ See above, n. 75. On the progress of knowledge, see *Soph. El.* 183b20f.; *De an.* 417b5f.; *EN* 1098a22f.

¹⁵⁰ *In Eucl.* p. 66.9. This passage of the *Catalogue* seems to me rather suspicious, since it describes Plato's role in the development of geometry.

¹⁵¹ ἐπαυξάνειν (p. 66.16), αὐξάνειν (p. 67.5), προαγαγεῖν (p. 67.7, 67.22) προέρχεσθαι (p. 66.17). See: Edelstein p. 92; Thraede (1965) col. 141f., 154.

¹⁵² Cf. Archytas (47B3).

¹⁵³ οἱ δὲ ζητήσαντές τε καὶ εὑρόντες ἱητρικὴν (5), οἱ πρῶτοι εὑρόντες (14).

πρῶτος εὐρετής, so popular in the sixth and the fifth centuries,¹⁵⁴ maintains its significance for many genres practiced by the Peripatetics. Some of them contributed to heurematography, having written books with the standard title *περὶ εὐρημάτων*.¹⁵⁵ Again, *εὐρήματα* as a standard topic of philosophical biography goes back to the originator of this genre, Aristoxenus (fr. 23–24). The same topic is widely presented in Dicaearchus' *Βίος Ἑλλάδος* as well as in Aristoxenus' and Dicaearchus' works on the history of poetry and music.¹⁵⁶ The principle of the *πρῶτος εὐρετής* was no less relevant for Theophrastus' doxography than for Aristotle's.¹⁵⁷

It is quite natural, therefore, that the question *τίς τί εὑρεν* underlines the entire work of Eudemus on the history of science, the more so as in this field the idea of priority was particularly important. Indeed, expressions connected with the idea of *πρῶτος εὐρετής* occur in almost every fragment of Eudemus' historical writings,¹⁵⁸ so that these writings can be conceived as a detailed answer to the question "who discovered what?" Yet, in spite of their closeness, the history of science was rather a by-product of the early heurematographic tradition than its direct heir. In itself, the question about *πρῶτος εὐρετής* does not entail a historical approach. Depending on the genre and context, every element of this question — "who," "discovered," and "what" — could receive primary significance or retreat into the background. For the history of poetry and music the personality of the *πρῶτος εὐρετής* was more important than for heurematography, which was interested not so much in the actual discoverers of the past, whose names were of course un-

¹⁵⁴ Kleingünther; Thraede (1962) col. 1191ff.

¹⁵⁵ Theophrastus (fr. 728–34 FHS&G), Heraclides of Pontus (fr. 152 Wehrli), Strato (fr. 144–47 Wehrli). Aristotle also wrote on this subject (fr. 382, 479, 501, 600, 602 Rose = fr. 924 Gigon).

¹⁵⁶ Aristox. fr. 78–81, 83, Dicaear. fr. 57, 75–76, 85.

¹⁵⁷ Theophr. *Phys. op.* fr. 1, 2, 4, 6a, 17 Diels = fr. 225, 226A, 227D–E, 228A FHS&G. Aristotle called Thales *πρῶτος εὐρετής* of natural philosophy (*Met.* 983b20), Socrates — of ethics (*Met.* 1078b17), Empedocles — of rhetoric, Zeno — of dialectic (fr. 65 Rose), the Pythagoreans — the founders of mathematics and number philosophy (*Met.* 985b23f.); see also fr. 72 Rose; Mansfeld (1990) p. 44f.

¹⁵⁸ Fr. 135–41, 144–48. See also Procl. *In Eucl.* p. 64.18, 65.7f., 65.21, 66.4f., 67.2f., 67.20f., 213.7f., 250.20f., 283.7f.; Eutoc. *In Archim. De sphaer.* III, p. 88.18–23, *Schol. in Eucl.* p. 273.3–13, and my discussion above, p. 272–75. Cf. the subtitle for the abridged version of his *History of astronomy*: *τίς τί εὑρεν ἐν μαθηματικοῖς*; (Ps.-Heron. *Deff.* IV, p. 167.9 Heiberg = Eud. fr. 145).

known, as in the cultural innovations ascribed to them. As a result, more than half of the *πρῶτοι εὕρεταί* mentioned in the ancient “catalogues of discoveries” are gods and heroes, and the catalogues themselves resemble dry inventories, lacking even systematic, to say nothing of chronological order. In doxography, the references to *πρῶτος εὕρετής* are built into the chronological-systematic scheme and are used only as supplementary classifying signs. As for Eudemus, in attempting to express the dynamics of development of the exact sciences, he bases his inquiry not on systematics of discoveries but on the chronology of their authors, which gives his works a historical perspective.

5

The most difficult question concerns the origin of Eudemus’ information on the mathematicians before the middle of the fifth century. All that I have to say here has a preliminary character. Eudemus evidently used the works of Oenopides, Hippocrates, Archytas, Theaetetus, Eudoxus, and his students, but it is hard to say definitively whether they contained any historical information. In principle, this does not seem impossible: we know that Archytas approvingly refers to the views of his Pythagorean predecessors (*οἱ περὶ μαθήματα*, 47B1) and mentions Philolaus’ student Eurytus (A13). One could guess that Hippocrates too referred to the Pythagorean mathematical compendium, preceding his *Elements* and comprising the basis of the first four books of Euclid.¹⁵⁹ Such a guess is indirectly confirmed by the notice, going back to Eudemus, that the whole book IV of the *Elements* belongs to the Pythagoreans.¹⁶⁰ Eudemus obviously could not refer to the fourth book of Euclid’s *Elements*, but it is very likely that this book, devoted to the relations between regular polygons and a circle, took up the same place in the *Elements* prior to Euclid.¹⁶¹

Eudemus’ other possible source was the book *On the ancient poets and musicians* by Glaucus of Rhegium, a contemporary of Democritus. Glaucus can be viewed as a predecessor of Eudemus in the history of Greek music and poetry: he gives a chronological sketch of these arts,

¹⁵⁹ See: Neuenschwander p. 357ff., 378; van der Waerden (1978) p. 354ff.

¹⁶⁰ See above, n. 20.

¹⁶¹ According to Neuenschwander (p. 374f.), the fourth book was compiled by the Pythagoreans before Hippocrates, who used it in his quadrature of lunes, and was subjected later to very minor changes.

relying mainly on the εὑρήματα of the musicians. Glaucus' book was used by Aristoxenus (fr. 91), so it must have been known to Eudemus. It is hardly by chance that his histories reveal the same pattern of organizing material according to the chronology of the πρῶτοι εὑρεταί, as in Glaucus. We know that Glaucus has not limited his book to the musicians: he mentioned, e.g., Empedocles and the Pythagorean teachers of Democritus (frr. 5–6 Lanata), whereas Aristoxenus referred to Glaucus in his description of Hippasus' acoustical experiment, based on mathematical proportions (fr. 90). Thus, Glaucus' book could have been a source of information not only on Hippasus, but also on the early theory of proportions, which from its very beginning was closely connected with harmonics.¹⁶²

Hippias of Elis, to whom Eudemus' reference to Mamercus (*In Eucl.*, p. 64.11f.) can be traced, is considered to be one of his main sources. Judging by the context of Hippias' book on "related ideas," recently investigated by A. Patzer, this reference was hardly isolated. Since Hippias played a very important role as a transmitter of Thales' δόξαι, it is more probable that he named Mamercus along with the other famous geometers of the sixth century, Thales and Pythagoras. But while Patzer believes that geometry also belongs to the *Themenkreisen* examined by Hippias,¹⁶³ his own reconstruction of Hippias' book leaves barely any room to suppose that it contained particular mathematical material. Now, it would be worthwhile to make more precise what is meant here by "geometry." Hippias quite likely wrote that Thales, Mamercus, and Pythagoras became famous for their studies of geometry, and that among the barbarians the Egyptians are well known for their geometrical knowledge. I would not exclude the possibility that he even made references to some particular problems studied by the early mathematicians. What seems to me highly improbable is that Hippias quoted geometrical propositions at length, including their proofs, e.g., the Pythagorean proof of the theorem that the sum of the interior angles of a triangle is equal to two right angles.¹⁶⁴ Eudemus clearly knew substantially more about the proofs offered by Thales and

¹⁶² See above, p. 271f., nn. 31–32, cf. 47B2 (Archytas) and Eud. fr. 142. Glaucus' origin in Rhegium might point to his Pythagorean connections.

¹⁶³ Patzer p. 106f.

¹⁶⁴ Eud. fr. 136. Cf. the other ancient proof that probably goes back to Thales (Arist. *An. Pr.* 41b13–22).

by the other early mathematicians than could be included in Hippias' *Συναγωγή*.¹⁶⁵

In the passage excerpted by Philodemus it is easy to discern several ideas familiar to us from Eudemus' works: the notion of scientific progress, the idea that it was especially rapid in the last decades, the replacement of old theories by new ones (with a reference to the authors of these theories), the appearance of new methods (analysis and diorism), and even the idea of approaching perfection (τὰ περὶ μετρολογίαν ἦλθεν ἐπὶ κορυφῇν). It is very possible that Eudemus knew the work quoted by Philodemus, but what could he borrow from it? This "biography" of Plato touched the exact sciences only in passing, in connection with his influence on the progress of geometry and the other sciences. Earlier, Aristotle also mentioned rapid progress in mathematics, indeed, without naming Plato,¹⁶⁶ and Eudemus certainly shared his attitude. As for the specific facts mentioned in the papyrus passages, Eudemus had to know of them at first hand, and not from the book on Plato.

Hermodorus' book *Περὶ μαθημάτων* was probably a more widely oriented work. Regrettably, one can only guess about its subject matter: in the two short citations from it, it is not mathematics but Zoroaster and the Persian Magi who are mentioned.¹⁶⁷ Not much more is known about the other academic treatises, which, judging from their titles, could contain some information on the history of the exact sciences.¹⁶⁸ There is too little evidence to consider Speusippus and Xenocrates to be the sources and/or predecessors of Eudemus;¹⁶⁹ apart from every-

¹⁶⁵ We can more confidently consider the *Συναγωγή* as one of the sources for Eudemus' *History of theology*.

¹⁶⁶ See above, n. 75.

¹⁶⁷ D.L. I.2 and 8. And yet, it is worth noting that Diogenes mentions Hermodorus in the context of discussion of the origin of philosophy, and that next to him he quotes the opinions of Aristotle and Eudemus about the Magi (I.8–9 = Arist. fr. 6 Rose, Eud. fr. 89). Aristotle's opinion comes from his dialogue *De philosophia* that traced the barbaric origins and further development of philosophy; that of Eudemus comes most probably from the *History of theology* (fr. 150), and not from the *Physics*, as Wehrli thought. Relying on the analogies (for we have nothing else in this case), one can guess that Hermodorus' book too was devoted to the history of scientific, especially mathematical knowledge, beginning from its origin in the Orient.

¹⁶⁸ See above, p. 279, nn. 69, 72.

¹⁶⁹ A fragment from Speusippus' book *On the Pythagorean numbers* (fr. 28 Tarán) contains some information on the Pythagorean arithmetic, which is, however, inter-

thing else, they seem to be unconcerned with the actual mathematical problems of their time. Although it would be unfair to say that the Academicians were interested in the history of science *only* to the extent that it was connected with Plato's activity, they nevertheless wrongly attributed to him the role of the "architect of the exact sciences."¹⁷⁰ Therefore, we can suppose that the academic writings were not so much a basis for Eudemus' work, but rather a stimulus to him in elaborating his own conception of scientific development. It is thus no surprise that in his history of the exact sciences there was no place left for Plato.

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mingled with his own arithmological interpretations. The only thing that can be found in Xenocrates is his reference to Pythagoras' discovery of harmonic intervals (fr. 87 Isnardi Parente).

¹⁷⁰ For further instances, see Zhmud (1998) p. 215ff.

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14

Eudemus' History of Early Greek Astronomy: Two Hypotheses*

Alan C. Bowen

1. Introduction

According to scholarly tradition of long-standing, Eudemus, who apparently lived in the late fourth and early third centuries BC, was the author of a work on earlier Greek astronomy. Nothing remains of it today. In fact, all we have of it now are seven reports or *testimonia* that date from the early third to the sixth century AD and concern claims Eudemus made—four of these mentioning the work's title. So, the prospects for any inquiry into what Eudemus said about early Greek astronomy and how he said it are dim indeed. Yet, even if it is impossible to know what Eudemus wrote, we can still advance the inquiry somewhat by formulating hypotheses that are responsibly based on what little information we do have, hypotheses to be recast as questions that will direct us in the further study of ancient astronomy.¹

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¹ For argument that such hypotheses do not constitute historical knowledge, and for an account of the role of such questions in historical inquiry, see Bowen, p. 806–12.

To this end, I propose in this chapter to examine briefly the reports of what Eudemus is supposed to have said about Thales of Miletus (6th c. BC). This study will come in two parts: the first concerning the details of what Eudemus purportedly attributed to Thales concerning solar eclipses; and the second, the nature of Eudemus' written work on astronomy. My general conclusions are the hypotheses that, according to Eudemus, Thales predicted an eclipse as well as explained what this phenomenon is; and that Eudemus' treatise was a doxography organized primarily by person and lacking critical analysis.

2. Thales and Solar Eclipses

2.1 *Eudemus on Thales: Testimonia*

In his *Astronomical Histories* (ἐν ταῖς ἀστρολογικαῖς ἱστορίαις)² Eudemus says that Thales predicted the eclipse of the Sun that occurred in the times when the Medes and the Lydians were joined in battle with one another, when Cyaxares the father of Astyages was king of the Medes and Alyattes (the son) of Croesus (was king) of the Lydians. Herodotus in fact agrees with Eudemus in the first book.³ The times were around the 50th Olympiad.⁴

Clem. Alex. *Strom.* 1 14.65.1; fr. 143W

According to some,⁵ as Eudemus says in his *History of Astronomical Subjects* (ἐν τῇ περὶ τῶν ἀστρολογουμένων ἱστορίᾳ),⁶ it seems that (Thales) was the

² As I indicate in section 3 below, ἱστορία and ἱστορίαι cover a wide range of meanings. My aim in translating them by "history" and "histories" respectively, is not to prejudge the question of their meaning in fr. 143–44 and 148W but to keep it open by using an English cognate that is equally vague. The plural, by the way, need not mean that Eudemus wrote more than one treatise on astronomy, but only that it came in more than one book. The analogy would be with Herodotus' *Histories*. See below, n. 3.

³ ἐν τῇ πρώτῃ *scil.* ἱστορίᾳ. I take it that Clement views each of the various books comprising Herodotus' ἱστορίαι as a ἱστορία.

⁴ *Scil.* 580 BC to 577 BC.

⁵ Taking κατά τινας as coming from Eudemus himself. As others have noted, given the syntax, it may come from Diogenes, in which case the translation should be, "According to some, it seems that (Thales) was the first to study astronomy and to predict both solar eclipses and solstices, as Eudemus says in *History of Astronomical Subjects*." For reasons that will become clear in section 2.2, I shall assume the former reading.

⁶ Or *History of Things Studied by Astronomers* or, again, *History of Astronomy*. The question is whether the participle ἀστρολογουμένων is neuter plural and passive,

first to study astronomy (ἀστρολογῆσαι) and to predict both solar eclipses and solstices. For this reason both Xenophanes and Herodotus marveled at him; and both Heraclitus and Democritus bear witness for him.

D.L. 1.23; fr. 144W

or whether it is masculine plural and middle. If one chooses the latter, the title may be rendered as *History of Those Who Study Astronomy* or even just as *History of Astronomers*. One should like, of course, to settle the matter by surveying other occurrences of ἀστρολογέω in the Greek corpus. But such a survey is, I find, unavailing in this particular case.

To begin, while fr. 144W and D.L. 3.29.2 confirm that Diogenes follows such diverse earlier writers as Theophrastus, Sosipater, Polybius, Diodorus Siculus, Lucianus, and Athenaeus in using the active forms of ἀστρολογέω to represent what astronomers do, and while the two occurrences of middle-passive forms in D.L. 5.94 and 8.88, respectively, are plainly neuter plurals and passive, this does not warrant any conclusion about the meaning of ἀστρολογουμένων in fr. 144W. After all, we have no credible way to decide whether the designation of Eudemos' treatise in fr. 144W comes from Diogenes himself or is taken by him from another source. Moreover, even if the title comes from Diogenes—and it well might, given that no one else refers to the treatise this way—it nevertheless does not follow immediately that the title should be *History of Astronomical Subjects* or *History of Astronomy* as I have suggested. The additional datum one may adduce to support this inference is that, of the six passages in which Diogenes calls astronomers ἀστρολόγοι, four (D.L. 1.43, 8.86, 9.56, 10.93) appear to represent his own usage. (I discount the occurrences in D.L. 1.34, 1.119 because they belong to explicit citations of other writers.) That is, in light of the additional fact that Diogenes designates astronomers as ἀστρολόγοι rather than as ἀστρολογούμενοι, there emerges a modest presumption that left to his own devices he would use only a passive participial form of ἀστρολογέω and not a middle participial form.

Now, suppose for the sake of argument that the title does not come from Diogenes but from another source, and turn to the TLG Disk E to assist a search for occurrences of ἀστρολογέω prior to the fourth century AD. What we find are (a) some nine occurrences (in the writings of seven different authors) of this verb in various active forms (finite, infinitival, and participial) that may be dated with confidence, (b) seven occurrences (coming from as many writers) that may or may not fall within this time period, as well as (c) three occurrences of the neuter plural passive participle (Clem. Alex. *Strom.* 6.4.35.4, Cleom. *Cael.* 2.1.408 [Todd], and Plut. *Plat. quaest.* 1001F) and (d) one occurrence of the masculine middle participle in recension β and another in recension γ of the *Historia Alexandri Magni*, a work composed at some unspecifiable time after the fourth century BC. (Incidentally, there are no instances of finite and infinitival forms of ἀστρολογέω in the middle or passive voices anywhere in the texts collected on the TLG Disk E.)

This does not, I regret, take us very far. In the first place, it is too little information to establish even a Peripatetic usage. That Theophrastus, for example, calls astronomers ἀστρολόγοι (as does Aristotle) and once writes ἀστρολογέω in the aorist active (*De signis* 4) tells us nothing about whether he would write ἀστρολογουμένων or how he would mean this participle. And it helps little if we contend that, while the

This much Adrastus. Dercyllides has written about these matters in no fitting or proper order. Nevertheless, what he too makes known himself in his (book), *On the Spindle and Whorls Mentioned in the Republic by Plato* (ἐν τῷ περὶ τοῦ ἀτράκτου καὶ τῶν σφονδύλων ἐν τῇ Πολιτείᾳ λεγομένων), is as follows.

[iii 40. Who discovered what in mathematical science]⁷

earliest explicit occurrence of the neuter plural passive participle is in the passage from Plutarch just mentioned and so dates from roughly the early second century AD, the usage of the passive participles in Cleom. *Cael.* 2.1.408 “goes back” to Posidonius (ca. 135 BC to ca. 51 BC) or that in D.L. 5.94 and 8.88 “go back” respectively to a Heraclides (dates unknown) and Eudoxus (4th c. BC). The days when it was acceptable to read everything in Cleomedes’ treatise as coming from Posidonius have long past. Indeed, Ian Kidd, the latest editor of the Posidonian fragments, does not include this passage from Cleomedes (see Kidd); and he is surely right to omit it, since the passage in which the participle occurs stands out in the treatise as a piece of rhetoric in the style of the Second Sophistic (see Bowen and Todd). As for D.L. 5.94 and 8.88, there is no objective way to settle whether the language in them derives from Heraclides and Eudoxus, though my suspicion is that it does not. In D.L. 8.88 at least, ἀστρολογούμενα seems better read as a later way of designating the astronomical works by Eudoxus whose titles have survived (*Phaenomena*, *Enoptron*, *De velocitatibus*, *Octaeteris*) rather than as the title of yet another treatise. (Is one also to hold that Eudoxus wrote a treatise called Γεωμετρούμενα?)

Of course, one might hope to resolve the matter by pointing to the prevalence in the period before the fourth century AD of the active forms of ἀστρολογέω to represent what astronomers do, and supposing on this basis that ἀστρολογουμένων in fr. 144W is probably neuter and passive. But this would be rash. If we must decline to infer from Theophrastus’ usage any view about participles in the middle-passive form, how may we make this inference here? Merely counting isolated occurrences in a small number of passages is hardly a critical method for making a philological decision of this sort. Further, since we have only five instances of middle or passive participles of ἀστρολογέω to consider, it seems ill-advised to ignore the possibility that the middle participial form (attested in the recensions of the *Hist. Alex. Mag.*) may be quite early. As I see it, while the TLG Disk E shows us that there are two possibilities for rendering ἀστρολογουμένων in fr. 144W, it does not provide us a secure basis to move from merely determining such possibilities to identifying what is likely or probable in the case at hand. In short, if the title comes from a source other than Diogenes, there is, I fear, no way to determine the meaning of this participle that is not subjective and arbitrary.

The upshot is that any attempt to convert the Greek of fr. 144W into English is going to be uncertain in its rendering of ἀστρολογουμένων. Still, a choice must be made. Accordingly, I have arbitrarily translated the title in fr. 144W as though it comes from Diogenes himself, and have presumed with all due diffidence that he would not use a middle participial form of ἀστρολογέω.

⁷ These chapter titles are found in the codices but are not thought to belong to Theon’s work originally. The chapter numbers are given in Martin’s edition.

Eudemos reports (ἱστορεῖ) in his *Astronomies* (ἐν ταῖς ἀστρολογίαις)⁸ that Oenopides was the first to discover the belt of the zodiacal circle⁹ and the cycle of the Great Year; that Thales (was first to discover) an eclipse of the Sun and its going-round (περιόδον) with respect to the solstices, how (this going-round) does not always turn out the same;¹⁰ that Anaximander (was first to discover) that the Earth is in mid-air and moves¹¹ about the middle of the cosmos; and that Anaximenes (was first to discover) that the Moon gets its light from the Sun and how (the Moon) suffers eclipse. And the rest found out other things in addition to these discoveries: (namely) that the fixed (stars) move round the axis through the poles which remains at rest; that the wandering (stars move) round the axis of the zodiacal (circle) which is at right angles to (the circle); and that the axis of the fixed (stars) and (the axis) of the wandering (stars) are separated from one another by the side of a (regular) polygon with 15 sides, which is 24 degrees.

Theon of Smyrna *Exp.* 3.39–41
(Hiller p. 198.9–199.8) includes fr. 145W

2.2. Explanation and prediction

There are three reports describing what Eudemos wrote about Thales of Miletus and a solar eclipse. Both Clement of Alexandria (*ca.* 150 to

⁸ The title that Theon reports, ἐν ταῖς ἀστρολογίαις (“in his *Astronomies*”), is puzzling. My inclination is to interpret this title in the light of fr. 143W in which Clement calls Eudemos’ work “*Astronomical Histories*”; that is, to suppose that, where Clement views each book of Eudemos’ treatise as an astronomical history, Theon (perhaps following Dercyllides) designates it as an astronomy, i.e., a written account of astronomy. Thus, I take ἐν ταῖς ἀστρολογίαις to be a title or designation that can be unpacked as “in his astronomical books” or “in the books of his astronomical treatise”: cf. Martin, p. 323; Dupuis, p. 321. Some translators (e.g., Heath, vol. 2, p. 244; cf. Kirk, Raven, and Schofield, p. 82) ignore the plural and write “in his *Astronomy*”: see below, n. 24 for fr. 148W. The version of the title Theon reports may be nothing more than a variant of the title found in fr. 143W that is offered in order to avoid writing ἱστορεῖ... ἐν ταῖς ἀστρολογικαῖς ἱστορίαις.

⁹ διὰζωσιν] λόξωσιν Diels: cf. Aët. *Plac.* 2.12.2 But see Theon, *Exp.* 3.10 for ζῳδιακὸς κύκλος as (a) the circular band containing the zodiacal constellations, and as (b) the circle through the middle of this band that is tangent to the tropic circles, a circle now known as the ecliptic: cf. Martin, p. 86–87, 323.

¹⁰ If the summer and winter solstices are the two days of the year when the Sun reaches the northernmost and southernmost rising points on the horizon respectively, then the object of concern may be either that the number of days from one summer (or winter) solstice to the next is not always the same, or that over the years there was an occasional variation in the number of days from summer to winter solstice and from winter to summer solstice. There is no mention of the equinoxes here, so it is perhaps misleading to say that some inequality in the length of the four astronomical seasons is meant. But see, e.g., Bulmer-Thomas, p. 463; Kirk, Raven, and Schofield, p. 83.

¹¹ κινεῖται: Montucla (vol. 1, p. 107) suggests κείται (lies).

between 211 and 216) and Diogenes Laertius (3rd c. AD) propose that, according to Eudemus, Thales predicted a solar eclipse; they differ only in the sense that Clement leaves open the question of whether Thales was the first to do this. So far so good. The difficulty is the meaning and status of the claim made by Theon of Smyrna (perhaps 2nd c. AD¹²) that, according to Dercyllides (1st c. AD),¹³ Eudemus reported that Thales was first to discover (εὑρε πρώτος) a solar eclipse. According to some scholars, what Theon reports of Eudemus on the authority of Dercyllides is but another version of what one finds in the reports of Clement and Diogenes, and so means that Thales was the first to predict a solar eclipse.¹⁴ But, as I read it, the report makes much better sense if its force is that Thales was the first to explain what a solar eclipse is or why it occurs. After all, granted that “he was first to discover an eclipse of the Sun” is not the absurd claim that he was the first to see a solar eclipse, then, I submit, this locution is better interpreted as a compressed way of saying that he discerned its causes rather than that he stated in advance that one was going to occur.¹⁵

¹² All one may learn about Theon’s dates from the internal evidence of his writings is that he mentions Thrasyllus (early 1st c. AD) and Adrastus (1st c. AD, after Thrasyllus). Thus, given that Theon is in turn mentioned by Calcidius (late 4th c. AD) and Proclus (410–485) (see Martin, p. 10–11, 69–72, 74–79), it follows that Theon lived sometime between the late first and late fourth centuries AD. Attempts to narrow this range by arguing that Theon must have lived before Ptolemy, because he would have mentioned Ptolemy if he had lived after him (see Martin, p. 10–11; Dupuis, p. v), are not compelling. There is, however, a bust from Smyrna bearing the inscription, “Theon, the priest, for his father, Theon the Platonic philosopher” (see Martin, p. 11–12), and this bust has been dated stylistically to the time of Hadrian (see Dillon, p. 397). If this stylistic dating is correct—and I remain sceptical that it is—then our Theon lived in the early 2nd century AD. In any case, we should not follow Heath (vol. 2, p. 239) in inferring that the Theon mentioned in the *Almagest* is Theon of Smyrna: see Martin, p. 8–9; Toomer, p. 456 n. 83.

¹³ Martin, p. 11, 71–72.

¹⁴ e.g., Dicks [1959] p. 295–96; Guthrie, p. 49.

¹⁵ One might object that, in the context of Babylonian astronomy, discovering an eclipse might involve no more than seeing (= discovering) the eclipse on a day on which it was known that an eclipse was possible, and that this may be what Diogenes or Eudemus had in mind. The problem here is that, so far as I know, there is no evidence at all in any other documents of an awareness on the part of the ancient Greeks at any point in their history that Babylonian eclipse predictions were in point of fact determinations of eclipse possibilities, that is, of when one should go out and look to see if an eclipse occurs. And so I hesitate to credit the Greeks with this awareness on the strength of this passage alone, especially when the passage can be read other ways.

Now, it is often held that, if Eudemus made both claims, then he must have inferred—albeit wrongly or without justification—that Thales knew what causes a solar eclipse from the fact that Thales had predicted one.¹⁶ But what underlies this view is, I think, a rather uncritical appreciation of Herodotus, *Hist.* 1.74 (which includes 11A5 DK). Indeed, as it turns out, both these alternatives concerning Thales' accomplishment may be found in this well-known report:

After this, since Alyattes did not surrender the Scythians to Cyaxares on his demand, there was a war among the Lydians and the Medes for five years. On many occasions the Medes defeated the Lydians and on many other occasions the Lydians defeated the Medes; and they even fought a battle at night. But, as they were carrying out the war with equal success, it happened to them in an engagement in the sixth year that day suddenly became night while the battle was joined. Thales of Miletus had proclaimed (προγγόρευσε) to the Ionians that this transformation of day was going to occur, setting as a limit this year in which the change actually occurred. When the Lydians and the Medes saw night coming on in place of day, they ceased from battle and both (sides) were somewhat more eager that there be peace with each other.

It is usually thought that Herodotus (5th c. bc) means only to attribute the prediction of a solar eclipse to Thales. But, as I have argued elsewhere,¹⁷ this passage is in fact underdetermined. To begin, it is uncertain that the report actually concerns an eclipse. After all, Herodotus says nothing about what caused the sky to go dark and he omits the sort of detail found characteristically throughout the later literary references to eclipses, namely, some description of the fear experienced by the witnesses and of how they allayed it (if they did) or a remark to the effect that the stars came out.¹⁸ Moreover, even if the cause were an eclipse, the report is ambiguous. In fact, it may mean that Thales predicted the eclipse and specified the year in which it was to occur; or it may mean that he explained the eclipse by pointing out that such eclipses take place only at given moments during the Sun's annual course, that is, when its conjunctions with the Moon satisfy certain conditions. (Whether such a causal explanation preceded or followed

On Babylonian eclipse cycles in Greco-Latin literature, see Bowen and Goldstein (1996) p. 169–71.

¹⁶ See notably Kirk, Raven, and Schofield, p. 82; cf. Guthrie, p. 49.

¹⁷ Bowen, p. 833–39.

¹⁸ See, e.g., Thucydides, *Hist.* 2.28.1. Such a remark is consistent with the occurrence of a total, or very nearly total, solar eclipse.

the eclipse is immaterial: in either case Thales could rightly be said later to have proclaimed that it was going to happen.) But suppose that it were not an eclipse. Suppose instead that the cause were a seasonal storm. Herodotus' report would then mean either that Thales predicted it—perhaps on the basis of a yearly almanac correlating stellar and meteorological phenomena, and of the sort indicated in the literature of Herodotus' time¹⁹—or that he explained it as an annually recurring event. Moreover, all these various possibilities take for granted a matter of some doubt, namely, that the phenomenon observed by the contending armies was the same phenomenon mentioned by Thales to the Ionians.²⁰ In sum, Herodotus' testimony about Thales does not by itself count as sure evidence for anything that Thales did. At the same time, however, it is clear that, due to the ambiguity of *Hist.* 1.74, Herodotus' authority may well have served in fact to support quite different views of Thales' accomplishment; and, thus, that neither of the two alternatives assuming that Thales was concerned with a solar eclipse may be better founded than the other.

According to Clement, Eudemus and Herodotus were in agreement about the circumstances of Thales' prediction of the solar eclipse—which may mean that Herodotus was Eudemus' source. If so, it seems easier to imagine that, if Herodotus were also the source for Eudemus' claim reported by Theon *via* Dercyllides that Thales explained the eclipse, Eudemus' direct source for this claim was some intermediary—assuming, of course, that it would be odd for Eudemus to offer two rival interpretations of one and the same text without any apparent comment or explanation. So, was there anyone dating from Eudemus' time or earlier who maintained that Thales explained the eclipse?

In point of fact there is no one we can name, so far as I can tell. Still, it certainly seems possible that there was someone, if we recall the anonymous commentary on book 20 of Homer's *Odyssey*.²¹ When its author comes to *Od.* 20.156, he takes occasion to discourse briefly on the day of the month on which solar eclipses occur, which brings him to remark:

¹⁹ Bowen and Goldstein [1988], p. 74–77.

²⁰ Newcomb, p. 28–29.

²¹ This commentary dates perhaps from the first century AD though the script indicates that the papyrus itself may have been written a century later: see Haslam, p. 89–90.

That eclipses occur in νομήνιαι Aristarchus of Samos makes clear when he writes: Thales said that the Sun suffers eclipse when the Moon comes in front of it, the day on which the Moon produces the eclipse being marked by its concealment. (*P. Oxy.* 53.3710 col. 2.36–41)²²

Thus, Aristarchus (3rd c. BC), who presumably lived shortly after Eudemus, is reported to have cited Thales in a work now lost and otherwise unknown, for a causal explanation of how and when solar eclipses take place.²³ So, according to the anonymous commentator, it was possible at least by the mid-third century BC, say, to affirm that Thales explained solar eclipses without reference to any prediction.

In sum, we find two claims made about Eudemus by later sources—that he wrote of Thales' predicting a solar eclipse and that he wrote of Thales' explaining it. Both these claims may have been warranted ultimately by a reading of Herodotus, *Hist.* 1.74, though for his part Eudemus may have connected this text with the assertion that Thales made a prediction. In any case, we should no longer take it for granted that the claim of explanation was derived by inference from the claim of prediction.

As for whether Eudemus did in fact make these claims and whether they are true of Thales, these matters are unknowable if only because there is no credible way to verify the alternatives. Still, there seems nothing impossible about Eudemus' making these two claims and viewing them as independently true. And so he may well be the ultimate source for the appearance of the same two claims as they appear in the works of Cicero (*De div.* 112, *De re pub.* 1.25) and Pliny (*Hist. nat.* 2.53).

3. Eudemus' Treatise

It would seem that Eudemus' treatise came in at least two books,²⁴

²² For the text and its interpretation, see Bowen and Goldstein (1994). Cf. Aët. *Plac.* 2.24.1 (Diels p. 353–54 = 11A17a DK).

²³ I assume here, as in Bowen and Goldstein (1994), that the remark about Thales is actually cited from Aristarchus' writings: cf. Haslam, p. 107, Lebedev, and Mouraviev. But see Sider, p. 12–13.

²⁴ See fr. 143W with nn. 2–3 above and fr. 145W with n. 8 above, as well as Simplicius, *In Arist. de caelo* 2.12 292b10–25: Heiberg p. 488.18–24 = fr. 148W–

And, as Eudemus recorded in the second book of his *Astronomical History* and as Sosigenes who receives it from Eudemus recorded it, Eudoxus of Cnidus is said to be the first of the Greeks to lay hold of these sorts of hypotheses, after Plato, as Sosigenes states,

but what sort of information did these books convey and how were they organized? The occurrence of the term ἱστορία and its plural, ἱστορίαι, in the versions of the title assigned to Eudemus' work does not by itself take us very far, since even by Eudemus' time ἱστορία could designate an inquiry, the written result of an inquiry, as well as the knowledge gained thereby—all without any rigid restrictions on what questions constituted the inquiry, how its results were to be presented, and what sort of knowledge this afforded.²⁵ If, however, we judge on the basis of the extant *testimonia* and ignore for the moment the real possibility that they distort and misrepresent the original in various ways, it looks as though the treatise was not a work of astronomical theory so much as a compendium of *exempla*. That is, to judge from the remains, especially, from fr. 145W, Eudemus' treatise presented early Greek astronomy by naming astronomers and listing concisely their accomplishments and claims, with special attention to those who were first or key to the development of the field. In essence, then, it seems to have been a doxographical compilation rather than a critical study involving argument and systematic analysis or a narrative in intellectual history.²⁶

Let me elaborate. If we consider all the extant fragments and posit (for purposes of constructing a hypothesis on the basis of these texts) that they represent the substance and the spirit of Eudemus' treatise, then we may conclude that this treatise was primarily organized by person and that the astronomers chosen for consideration were those who had made some singular contribution. The detail about the Medes and the Lydians in fr. 143W and the concern with who did what first in fr. 144–48W point in this direction. Moreover, it is worth noting that none of the surviving fragments shows us an issue addressed by more than one astronomer; and yet we would surely need something like that if we were to hypothesize that Eudemus' treatise was organized primarily by problem or topic as Aëtius' *Placita* was, for example.

This hypothesis that Eudemus structured his treatise by person rather than by problem is consistent with the titles reported by Clement and

proposed to those who are serious about these matters this question, By positing which smooth and ordered motions can the phenomena concerning the motions of the planets be preserved?

²⁵ On Aristotle's use of ἱστορία as a title for his biological works, see Lennox, esp. p. 261–63.

²⁶ For a recent survey of the numerous compilations of *exempla* in Greek and Latin literature, their various purposes and formats, see Skidmore.

Simplicius (*In Arist. de caelo* 2.12 292b10–25: Heiberg p. 488.18–20 in fr. 148W), providing that we understand “*Histories*” or “*History*” to designate a mere listing of each astronomer’s views in summary form. And it would also be consistent with rendering the title in Diogenes’ report (fr. 144W) as *History of Those Who Study Astronomy* or *History of Astronomers*.²⁷ What is important, however, is that, if the title given in fr. 144W is *History of Astronomical Subjects* or *History of Astronomy* as I have proposed, it would still not follow that the treatise was organized primarily by problem rather than by person. At least, such an inference based on the title alone would not be warranted, since this is an empirical matter and it is surely relevant that there is no practical difficulty in calling a work dealing with the views of past astronomers a *History of Astronomy* or a *History of Astronomical Subjects* even when it is structured primarily by person, as the modern studies by Heath, Dreyer, and Dicks (1970) make clear.

As for my remark about the absence of critical analysis or narrative structure in the treatise, I should point out that in none of the *testimonia* that Wehrli has collected is there any sign of Eudemos’ offering his own explanation of some claim. The closest we come to an explanation is in the course of Simplicius’ remarks concerning Aristotle, *Met.* 12.8:

One has neither received a treatise of Callippus stating the reason why these spheres should be added nor has Aristotle given it. But Eudemos has related briefly the phenomena for the sake of which (Callippus) thought that these spheres should be added, since (Eudemos) says that (Callippus) said that, if in fact the time intervals between the solstices and equinoxes differ by as much as Euctemon and Meton thought, the three spheres for each are not sufficient to save the phenomena because of the variation clearly evident in the motions of (the Sun and the Moon). But for the sake of what (phenomenon Callippus) added the one sphere which he added in each of the three planets, Mars, Venus, and Mercury, Eudemos has related briefly and clearly. (Simplicius, *In Arist. de caelo* 2.12 293a4–11: Heiberg p. 497.15–24 = fr. 149W)

But, here Eudemos reportedly accounts for Callippus’ addition of two spheres in the cases of the Sun and Moon by citing *Callippus’* explanation. As for the last sentence, if we accept the text as it stands, it would follow that Eudemos gave reasons already stated by Callippus.

It is sometimes suggested that Eudemos’ writings were lost shortly after the fourth century BC, and that they survived only in excerpts,

²⁷ See above, n. 6.

epitomes, and compilations thereafter.²⁸ On this score, given the *testimonia* about his history of astronomy, we can certainly say that both Theon and Simplicius acknowledge access to Eudemus' treatise through intermediaries, Dercyllides and Sosigenes (2nd c. AD)²⁹ respectively. Further, judging from Theon's remark that Dercyllides' account was written "in no fitting or proper order," it would seem fair to say that this account was itself neither a narrative nor an exercise in analytical thinking or systematic argument, but a doxography organized circumstantially so far as astronomy and its history are concerned—say, perhaps, according to select themes in Plato's Myth of Er. In other words, what we seem to have here is an indication that either Dercyllides or some intermediary adapted passages taken from Eudemus' treatise to different ends, albeit within the same broad genre of doxographical writing.

4. Conclusion

We may never know whether Eudemus actually maintained that Thales both explained what a solar eclipse is and predicted one, unless the relevant parts of Eudemus' work come to light. Still, it is perhaps enough for now to establish that Eudemus is thought by our ancient sources to have made both claims, that he might have done so without committing a logical error, and that there is no compelling reason on our part for presuming that he did not make these claims. As for whether Eudemus was right to maintain that Thales did either or both of these things, this is yet another matter; and one that also lies well beyond our power to determine responsibly given the dearth of relevant information available for confirmation that has survived from Thales and his times.

Given that only with Ptolemy does observation become essential for constructing astronomical theory, and that in the era before Ptolemy Greco-Latin astronomy was a typically bookish enterprise, it would seem that our question of the nature of Eudemus' treatise raises immediately the fundamental issue of the various strategies, contexts, and formats in which astronomy was communicated in the centuries intervening between Eudemus and Ptolemy. So far as one can tell, Eudemus'

²⁸ e.g., Dicks [1959], p. 302.

²⁹ Above, n. 24.

treatise was the first of its kind in the field and as a history it may even have served to delimit the field by encapsulating its past. But for whom and for what purpose? There are two main intellectual contexts in which astronomy was pursued in the fifth and fourth centuries BC: medicine and philosophy. Now, if the treatise was written for medical writers and practitioners, it is difficult to imagine what questions of the time such a compendium of theorists and their astronomical accomplishments would actually serve to answer, especially since what survives of the treatise lacks any useful connection to the dominant medical concern with the risings and settings of the fixed stars. Perhaps, then, the treatise was intended for philosophers to have as a tool listing what was known about the heavens and the authorities responsible for this knowledge, a tool that might help them avoid egregious error or omission in their theorizing. In any case, if Eudemus' treatise was the first to delimit the field of astronomy, it was not taken by later writers as definitive of the field. To be sure, Eudemus himself was not, apparently, regarded as an astronomer as that term was understood either in his own time or subsequently. Moreover, the later Greco-Latin works in astronomy that are extant address particular problems or sets of problems often without showing any overt interest in the earlier history of astronomers and their contributions. Indeed, when later astronomical writers do show such an interest, they introduce a different sort of doxography, one that is organized by problem and iterates the various solutions that have been offered in the past.³⁰

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³⁰ The first occurrence of such interest is found in a few lines at the concluding columns of *P. Parisinus Graecus* I (2nd c. BC) concerning the various values for the division of the year into astronomical seasons: see Letronne or Blass.

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15

Eudemos Fr. 145 Wehrli and the Ancient Theories of Lunar Light

Dmitri Panchenko

For Jürgen Mittelstraß

1

Aristotle lived in a great age of science. At least he felt that this was so. He repeatedly refers in his works to achievements of contemporary mathematical astronomy as something firmly established (*An. Pr.* 46a19; *Meteor.* 339b8, 30; *De cael.* 297a4; *Part. an.* 639b8). Thus, it was time to write a history of science, that of mathematics and astronomy in particular. Eudemos accomplished this task.

Eudemos' *History of Astronomy* appears to be a record of major and indisputable achievements. Of the seven fragments preserved, five speak in terms of εἶπε πρῶτος (fr. 144–48 Wehrli). Such a situation can be due, of course, to the particular state of our sources. It is likely that a number of fragments came from a summary or extracts of Eudemos' work and such a source might easily have had an emphasis on the characteristically Greek preoccupation with "firsts," persons who made discoveries. It is equally likely, however, that the potential for this kind of abridgement was already built into Eudemos' own account. Eudemos is never cited for any theory which was obsolete by the

end of the fourth century BC. There was a relatively long history of Greek astronomy based on the supposition of a nonspherical earth. There must have been many theories, quite influential in their own time. We do not hear about any of them from Eudemus. Had he conceived of his task in a different way, our view of early Greek astronomy would be different too.

The fragments of the *History of Astronomy* give the impression that Eudemus is a basically reliable source. Only one qualification is needed. What the Peripatetics held to be true was not always undoubtedly so. For instance, Aristotle was certain that the moon emits some heat (this is clearly implied in *Meteor.* 373b28); he believed that the nights when the moon is full are warmer than those at the new moon (*Part. an.* 680a32; *Gen. an.* 738a20) and that, in general, “the moon makes a summer and winter in the course of a month just as the sun does in the course of the whole year” (*Gen. an.* 767a6; A. L. Peck’s translation; cf. 777b24; cf. further *De inund. Nil.* fr. 248 Rose: *plenilunio enim congelata tabescunt*).¹ Theophrastus shared this view (*De caus. plant.* 4.14.3; *De vent.* 17; ps.-Theophr. *De sign.* 5). This Peripatetic view could not be based on common experience. It is beyond our sense capacity to feel that nights when the moon is full are regularly the warmest. Such a view must have been derived from a general theory of lunar light. Therefore, a statement by a Peripatetic historian about εὐπε πρῶτος in respect to lunar light might easily refer to a very particular doctrine, while we would think that the statement concerns the general idea that the light of the moon depends on the sun.

2

Theon of Smyrna (*Expos. rer. math.* p. 198 Hiller; Eudem. fr. 145 Wehrli; 13A16 DK) cites Eudemus’ authority for the following statement: “Anaximenes was the first to discover that the moon has its light

¹ Aristotle is prepared to connect with this not only various phenomena of living organisms, but also earthquakes (*Meteor.* 367b20). In his note to Plutarch’s *De fac. in orb. lun.* 929E (p. 104, note a in the Loeb edition) Harold Cherniss mentions that Kepler asserted that he had felt the heat from the rays of the full moon concentrated in a concave parabolic mirror. If such an effect should be not treated as self-persuasion, an analogous experiment was available to the ancients too. Cherniss also notes that “the first real evidence of the moon’s heat was obtained by Melloni in 1846 by means of the newly invented thermopile.” But Aristotle clearly goes too far.

from the sun and in which way it suffers an eclipse” (Ἀναξιμένης δὲ [sc. εἶδρε πρῶτος] ὅτι ἡ σελήνη ἐκ τοῦ ἡλίου ἔχει τὸ φῶς καὶ τίνα ἐκλείπει τρόπον). This assertion is surprising because it contradicts doxographic tradition. In Stobaeus’ formulation, “Thales was the first to assert that the moon has its illumination because of the sun; Pythagoras, Parmenides, Empedocles, Anaxagoras, and Metrodorus held the same (or: a similar) view.” The parallel texts of other doxographers speak simply of “Thales and those who followed him” (*Dox.* p. 358; 11A17b DK). Here we have a list of philosophers including Anaximenes’ contemporary Pythagoras and his predecessor Thales, but not Anaximenes himself. Furthermore, the celestial bodies do not go under the earth in Anaximenes. He could still explain a lunar eclipse as caused by the earth’s shadow, because he assumed that the earth was high towards the north; thus it could be the cone of the earth which blocks the sun’s illumination of the moon. It is not very likely, however, that Eudemus would have treated such a theory as a principal achievement. There is also another difficulty: we are told that Anaximenes’ moon was a fiery body (*Dox.* p. 356; 13A6 DK; Anaximenes frs. 33–34 Wöhrle). That seems quite incompatible with a proper explanation of lunar light and lunar eclipses.²

Thus the manuscript reading is highly suspicious. This being so, a likely emendation is at hand. Another branch of Peripatetic tradition presents Anaxagoras as “the first who interpreted clearly the phenomena related to the eclipses and the lunar light” (οὗτος ἀφόρτισε πρῶτος τὰ περὶ τὰς ἐκλείψεις καὶ φωτισμούς). This is the formulation of Hippolytus (*Ref.* 1.8.10; 59A42.10 DK), which goes back to

² This was repeatedly emphasized, sometimes over-emphasized, by scholars; Heath p. 19, Gundel col. 77, Kirk p. 156, O’Brien p. 115, Wöhrle (1993) p. 78. The evidence for the composition of the moon in Anaximenes is hardly, however, sufficient. A purely fiery composition is in fact unlikely because there is no palpable heat from the moon, while we are told that Anaximenes’ moon, like the sun and the other stars, ultimately originated from earth (13A6 DK; Anaximenes fr. 8 Wöhrle). Stobaeus makes “fiery” the moon of both Anaximenes and Parmenides, but elsewhere he has an occasion to specify that the moon, according to Parmenides, originated from more dense, that is *cold* components of the Milky Way (*Ecl.* 1.25; *Dox.* p. 349; 28A43; cf. 43a DK); moreover, on another occasion he explicitly asserts that Parmenides’ moon was a mixture of fire and air (*Ecl.* 1.22; 28A37 DK). Whatever was the “fiery” nature of Parmenides’ moon, this did not preclude Parmenides from assuming that the moon borrows its light from the sun (28B14–15, A42 DK; Preaux p. 165 properly notes in this connection a similar combination of ideas in the Stoics).

Theophrastus.³ Also Plutarch says that “the first man to put in writing the clearest and boldest of all doctrines about the changing phases of the moon was Anaxagoras” (Plut. *Nic.* 23; Bernadotte Perrin’s translation in the Loeb series).⁴ It is important, further, that Hippolytus (*Ref.* 1.8.8), while specifying Anaxagoras’ view, uses practically the same expression as that in Eudemus’ fragment: “the moon does not have light of its own, but from the sun” (τὸ δὲ φῶς τὴν σελήνην μὴ ἴδιον ἔχειν, ἀλλὰ ἀπὸ τοῦ ἡλίου). This is also the case in the *Cratylus* (409A–B), where Plato makes Socrates say of Anaxagoras: “he asserted recently that the moon has its light from the sun” (ἐκεῖνος νεωστὶ ἔλεγεν, ὅτι ἡ σελήνη ἀπὸ τοῦ ἡλίου ἔχει τὸ φῶς). Moreover, the context in the *Cratylus* unambiguously implies that such an assertion was generally thought to be Anaxagoras’ innovation.⁵ To reverse the argument: to retain the manuscript reading Ἀναξιμένης in Theon’s text means that Eudemus stands in striking contradiction to Theophrastus and other, non-Peripatetic sources. Therefore, along with many scholars, I assume that we should read Ἀναξαγόρας.⁶

³ ἀφώρισε is a favorite Theophrastean word and the expression πρῶτος ἀφώρισε appears elsewhere in the *De sens.* (on Alcmaeon, *Dox.* p. 506) and in the doxographers (on Parmenides, *Dox.* p. 377).

⁴ πρῶτος σαφέστατόν τε πάντων καὶ θαρραλεώτατον ... λόγον εἰς γραφὴν καταθέμενος is slightly illogical. Perhaps, this came as a compromise between πρῶτος of the doxographic tradition, known to Plutarch, and his awareness of the fact that there had been basically correct views of the nature of lunar light even before Anaxagoras.

⁵ Cratylus insinuates that the name σελήνη is unfortunate for Anaxagoras, for the very structure of the word seems to forestall his recent assertion that the moon has its light from the sun. Cf. Plut. *De E apud Delphos* 391A–B: “... as Plato said that Anaxagoras was embarrassed by the name of the Moon, since he tried to claim as his own some very ancient opinion in regard to its illumination,” etc. (F. C. Babbitt’s translation in the Loeb series).

⁶ Tannery p. 157, Heath p. 19, Bicknell p. 58f., Wöhrle (1993) p. 78 and other scholars adopt this emendation. Zeller p. 326, Boll col. 2342, Burkert p. 343 and n. 29 prefer to retain the text. O’Brien p. 117 suggests the following: “The items which Theon excerpts from Eudemus’ *History of Astronomy* are made to depend on an initial εὑρε πρῶτος. In the case of Thales this leads to the pretty meaningless statement, εὑρε πρῶτος ... ἡλίου ἔκλειψιν ... Very possibly, in the case of Anaximenes, Eudemus said simply that Anaximenes gave *an* explanation of the moon’s eclipse. Theo’s formula turns this into εὑρε πρῶτος ... ἡ σελήνη ... τίνα ἐκλείπει τρόπον, with the subsequent (false) implication that Anaximenes gave the *correct* explanation of the moon’s eclipse.” This reasoning is not convincing. The vague formulation about Thales should be understood on the basis of the parallel text by a scholiast to Plato’s *Republic*: εὑρε γὰρ τὸν ἥλιον ἐκλείπειν ἐξ ὑποδρομῆς σελήνης (“he discovered that the sun suffers

Another difficulty immediately confronts us. If Anaxagoras was the first to advance the theory that the moon shines on account of light from the sun, what do we do with the two lines from Parmenides' poem where such a view is already stated? Both are quoted by Plutarch in two different works. The testimonies from Plutarch are clear and mutually consistent.⁷ The doxographic tradition also confirms that Parmenides' moon was "illuminated by the sun" (ἀπ' αὐτοῦ φωτίζεται *Dox.* p. 357; 28A42 DK). It is only in a heroic age of classical scholarship that one would dare to dismiss such evidence, as Paul Tannery and Sir Thomas Heath do.⁸

How can we reconcile Parmenides' verses, on the one hand, and testimonies for Anaxagoras' priority, on the other hand? A possible compromise has been suggested recently by Georg Wöhrle.⁹ He assumes that Parmenides advanced the doctrine that the sun makes the moon shine, but only Anaxagoras succeeded in making this theory widely known and accepted. Such an assumption entails, however, that Plato was not familiar with Parmenides' poem at the time of writing the *Cratylus*. Moreover, it remains unclear why the Peripatetics, who certainly knew Parmenides' poem, accepted the priority of Anaxagoras.¹⁰

an eclipse when the moon runs under it," 11A3 DK; see Panchenko [1996] p. 53f.). Now the whole selection that Theon used had already been made "to depend on an initial εὔρε πρῶτος," and this was based on Eudemus' text. The only confusion to suspect is, therefore, that of names. The confusion of the names Anaximander, Anaximenes, Anaxagoras appears repeatedly in our sources: Ioann. Lyd. *De mens.* 3.12 p. 53 Wünsch (Anaximenes instead of Anaximander); D.L. 2.11 and Clem. Alex. *Strom.* 1.78 (Anaxagoras instead of Anaximander); Ps.-Plut. *Plac.* 4.1, (one of the mss. reads Anaximenes instead of Anaxagoras); Stob. *Ecl.* 2.8 p. 156 Wachsmuth (Anaximenes instead of Anaxagoras; cf. 59A66 DK, as shown by Andrej Lebedev, in his Russian version of the *Vorsokratiker*).

⁷ *De fac. in orb. lun.* 929A; 28B15 DK (cf. Plut. *Quaest. rom.* 282A): τῶν ἐν οὐρανῷ τοσοῦτων τὸ πλῆθος ὄντων μόνη (sc. ἡ σελήνη) φωτὸς ἀλλοτρίου δεομένη περίεσι κατὰ Παρμενίδην αἰεὶ παπταίνουσα πρὸς αὐγὰς ἡελίοιο. *Adv. Colot.* 1116A; 28B14 DK: νυκτιφαῆς περὶ γαίαν ἀλώμενον ἀλλότριον φῶς.

⁸ Tannery p. 266, Heath p. 76f. This view was accepted by Guthrie vol. 1 p. 286 with n. 1, Guthrie vol. 2 p. 66 (with some hesitation) and Bicknell p. 58, n. 37. Plutarch's interpretation of the lines he quotes was accepted as basically correct by Diels p. 110–12, Boll col. 2342, Burnet p. 177 n. 1, Tarán p. 245 with n. 40, O'Brien p. 119f., Popper and Wöhrle (1995).

⁹ Wöhrle (1995).

¹⁰ Wöhrle's idea was anticipated to a degree by Zeller p. 124lf. and Burnet p. 177 n. 1 and p. 272, as my objections were anticipated in part by O'Brien p. 125.

I want to suggest a different solution. What mattered was not the intellectual influence of Anaxagoras in Athens as such; rather Anaxagoras elaborated a quite *specific* theory of lunar light, and this Anaxagorean theory, with its specific content, was accepted by the Peripatetics as basically true.

3

In antiquity there were *two* different theories of lunar light, each sharing the belief that the light of the moon is caused by that of the sun. We know this from a discussion of the subject in Cleomedes (2.4). According to one of the theories, the moon shines solely because it reflects the light of the sun. According to the other theory, there is a mixture of two lights: one is reflected, the other is the moon's own light; the latter, however, also comes from the sun.¹¹

Denis O'Brien made a very important step towards understanding the situation by pointing out this distinction. In his formulation, one should distinguish the theory of reflected light from that of derived light.¹² It is problematic, however, that a pure theory of derived light ever existed. As far as I can see, the idea of derived light appears always or at least typically in combination with that of reflected light. Thus the proper distinction would be between theories of reflected and theories of mixed, or combined, light. Further, O'Brien attributed to pre-Anaxagorean thinkers a theory of derived light, namely that the light of the moon is kindled by the sun. But there is hardly anything in our sources to confirm such an interpretation.¹³ The theory of reflected light, in the specified sense, is connected by O'Brien with Anaxagoras. We will see that this is certainly not correct. In reality, Anaxagoras held

¹¹ Plut. *De fac. in orb. lun* 929B–E has this distinction too, though not as clearly expressed as in Cleomedes.

¹² O'Brien p. 125.

¹³ O'Brien himself was fully aware of it (p. 123: "I must at once admit that there is no direct evidence for the fifth century of a moon whose light is kindled from the sun"). O'Brien's interpretation was well received by Preaux p. 169ff. But I cannot share it. According to the evidence from Stobaeus (*Dox.* p. 349; 28A43 DK), both Parmenides' sun and moon originated from the Milky Way (i.e., we have evidence on the origin of the moon in Parmenides, which does not imply the kindling by the sun). Further, the interpretation suggested by O'Brien depends on the assumption that the moon was a fiery body in both Anaximenes and Parmenides, which, as formulated without qualifications, is very problematic (cf. above, note 2).

the theory of combined light and became the most important authority for this theory.

It is said in the *Cratylus*: νέον δέ που καὶ ἔνον αἰεί ἐστι περὶ τὴν σελήνην τοῦτο τὸ φῶς, εἴπερ ἀληθῆ οἱ Ἀναξαγόρειοι λέγουσιν· κύκλῳ γάρ που αἰεὶ αὐτὴν περιῶν νέον αἰεὶ ἐπιβάλλει, ἔνον δὲ ὑπάρχει τὸν τοῦ προτέρου μηνός (“The light about the moon is always new and always old, if the Anaxagoreans say what is true. For the sun in his revolution round the moon always adds new light, and there is the old light of the previous month” — 409B; Jowett’s translation, modified).

If we take the Platonic words seriously, it follows that the moon not only shines by the reflected light of the sun, but also in some way absorbs and stores the light received from the sun. As David Sider has put it, “only if some light was physically absorbed could the moon glow from the light of the sun when the sun no longer shines directly on it.”¹⁴

Such an interpretation agrees well with Anaxagoras’ own words preserved by Plutarch (*De fac. orb. lun.* 929B; 59B18 DK): “the sun puts brightness into the moon” (ἥλιος ἐντίθησι τῇ σελήνῃ τὸ λαμπρόν). The verb implies something more than just a reflection. To quote Sider again, “the sun actually gives up some of its λαμπρόν ... which becomes part of the moon during and, to a lesser extent, after the time of direct illumination.”¹⁵ O’Brien himself suggested a similar interpretation of the fragment, but he concluded erroneously that we are dealing here with a transitional step to the theory of reflected light.¹⁶

Doxographers describe Anaxagoras’ moon as an ignited solid body—στερέωμα διάπυρον (*Dox.* p. 356; 59A77 DK). O’Brien has correctly noted: “this idea, that the moon stores and absorbs light, fits well with the idea that Anaxagoras’ moon does not simply reflect light, but is herself, at least to some extent a fiery body, as the doxographical tradition claims.”¹⁷

Finally we have direct evidence that Anaxagoras assigned a double nature to lunar light. Olympiodorus describes a view common to Anaxagoras and Democritus, according to which, “the luminaries have both their own light as well as light received from the sun. The moon is a clear example. It has some light of its own and some of the sun. Its

¹⁴ Sider (1981) p. 122.

¹⁵ Ibid.

¹⁶ O’Brien p. 127.

¹⁷ Ibid.

own light is coal-like, as is clear during an eclipse of the moon” (*in Meteor.* 1.8 p. 67f. Stüve; Democr. fr. 417; 399 Luria; not in DK).¹⁸ Olympiodorus does not specify the nature of the moon’s “own light” (ἴδιον φῶς). From the sources cited above, we can see that Olympiodorus’ expression is imprecise and that the moon’s nonreflected light was thought to have been absorbed from the sun. How the whole operates we can better understand on the basis of an overlooked fragment of Democritus. Before citing it, it is proper to recall that, according to our sources, Democritus held basically the same views of the sun and moon as Anaxagoras (*Dox.* p. 349; 356).

The fragment, which is preserved by Seneca (*Quaest. nat.* IVB 9.1), runs as follows: *Omne corpus, quo solidius est, hoc calorem citius concipit, diutius servat. Itaque si in sole posueris aeneum vas et vitreum [et argenteum,]¹⁹ aeneo citius calor accedet, diutius haerebit* (“the more solid an object is the more quickly it absorbs heat and the longer it retains it. And so, if you place a bronze vase and a glass vase in the sun, the heat will communicate itself more quickly to the bronze vase and cling to it longer.” Thomas H. Corcoran’s translation in the Loeb series).

This fragment helps us understand how the moon gets the nonreflected light, that light from the sun which Olympiodorus calls the “moon’s own.” The solid body of the moon (στερέωμα) does not absorb the light, but the heat of the sun. On account of this absorbed heat, it has additional dim light, like that of a hot piece of coal. We can see this light during lunar eclipses.

4

What was the reason for such a theory? The above cited passage from Olympiodorus shows that the double nature of lunar light was intended to account for lunar eclipses. This is not surprising, for it is rare that the moon becomes entirely invisible during a lunar eclipse. Usually the moon is seen shining with a dim red-coloured light despite the fact that the solar illumination of the moon is blocked by the body of the earth.²⁰

¹⁸ I accept the hardly disputable emendation ἔκλειψις for the manuscript ἔλλειψις; cf. Bicknell p. 58 n. 41.

¹⁹ Many editors delete *et argenteum*. This is irrelevant for our present purpose.

²⁰ In the somewhat rhetorical formulation of Pliny (*NH* 2.43), *deficiens* (sc. *luna*) *et in defectu tamen conspicua*.

Hence a natural conclusion was that the light of the moon cannot be explained in terms of reflection.

Anaxagoras' problem was not new. Preoccupation with the explanation of eclipses was characteristic of the early Presocratics (attested for Thales, Anaximander, Xenophanes and Heraclitus). Moreover Anaxagoras' theory was hardly the first to account for the dim light which is visible during lunar eclipses. The moon is a mixture of air and fire in Parmenides.²¹ Such a composition seems to presuppose the combination of reflected light and the moon's own light. Fire could be used to account for the dim red light during lunar eclipses. The innovation of Anaxagoras, as compared to Parmenides at least, seems to have been to assert that there is no lunar light other than that from the sun, that the moon receives from the sun all its light, both the reflected and nonreflected.

There were two reasons for this innovation. One may be inferred from Cleomedes, whose description of the theory of combined light follows closely the original, fifth-century definition. For it compares the moon's own light induced by the sun with "the light held by the red-hot iron in virtue of participation" (ὥς διάπυρος σίδηρος κατὰ μετοχὴν ἴσχει τὸ φῶς, Cleomed. 2.4. p. 68.28 Todd). The characteristically Anaxagorean word for a celestial body was μύδρος, while Olympiodorus explains μύδρος as red-hot iron (*in Meteor.* p.17.19 Stüve; 59A19 DK: μύδρος γάρ ἐστιν ὁ πεπυρακτωμένος σίδηρος). Furthermore, the illustration provided by Cleomedes recalls the above cited reasoning of Democritus.²² Therefore we may discern another echo of the fifth-century polemics in Cleomedes' remark that only dense bodies can reflect light (ἀπὸ δὲ μανῶν σωμάτων ἀδύνατον ἀνάκλασιν γίνεσθαι, Cleomed. 2.4 p. 68.37f. Todd). In a context in which the nature of lunar light is discussed, this must be an objection against the idea of a moon composed of air and fire. And such was the moon of some of Anaxagoras' predecessors and of Parmenides in particular. His predecessors were not, however, naive. The composition of the moon, air and fire, would explain why the huge body of the moon does not fall down. Anaxagoras was relieved of this difficulty. The meteorite that landed in Aegospotamoi might serve as an irrefutable

²¹ 28A37 DK: συμμιγῇ δ' ἐξ ἀμοιβῶν εἶναι τὴν σελήνην, τοῦ τ' ἀέρος καὶ τοῦ πυρός; cf. above, note 2.

²² A plausible source of Cleomedes is Posidonius, who is mentioned by Cleomedes and who defended a theory of combined light.

proof that celestial bodies could be solid and heavy. Thus Anaxagoras was able to construct a comprehensive theory of lunar light in accordance with the principles of optics. Because he assumed that the moon is a body of the kind which can both reflect light and absorb heat and, further, in virtue of this heat emit its own light, he was able to account at once for both lunar phases and the phenomenon of a lunar eclipse.

The assumption that the moon is a solid body provided him also with another advantage and enabled him to remove a contradiction which, I guess, caused much concern in the sixth and early fifth centuries. The correct explanation of solar eclipses had been advanced by Thales and his explanation had been confirmed each time a solar eclipse occurred towards the end of the lunar month, when the sun and the moon were in conjunction.²³ However, it was difficult to square Thales' theory with the apparent fact that the moon has its own light, that faint light which is visible during lunar eclipses, since that light is never visible during solar eclipses, when the moon, on Thales' theory, covers the sun. Thus the problem of the moon's dim light affected not only the explanation of lunar illumination but also that of solar eclipses. One could try to deal with this difficulty by making the moon a half-luminous body gradually turning around its axis, so that the moon would show us its dark side at the time of the conjunction with the sun. Thales himself could be the originator of such an idea and two versions of it are indeed attested, one for Heraclitus (fr. 61 Marcovich), the other for Berosus (*Dox.* p. 359, Vitruv. 9.2.1). But the mechanism of such a turning remained problematic. Anaxagoras managed to find a reasonable solution to the whole problem. Although he retained a double nature of the moon's light, this light was no longer reflected light, on the one hand, and the moon's own, on the other; now this light depended in both cases on the sun. One may follow Plato in calling this double light new and old, the former being reflected light, the latter, residual: it is visible only during lunar eclipses and is caused by the sun's heating the surface of the moon. When the solar illumination of the moon is intercepted by the body of the earth and the moon no longer reflects solar rays, we can see that dim red light which the surface of the moon emits "in virtue of participation," that is, because it was heated, before the eclipse had

²³ Panchenko (1996) and also Panchenko (1994b).

begun, by the rays of the sun. But Anaxagoras' moon is a large body, as large as the Peloponnese (Plut. *De fac. in orb. lun.* 932A, not in DK²⁴) and therefore the sun's rays would heat and make shine with a dim red light only the surface of the moon turned towards the sun and not its opposite side.²⁵ At the time of conjunction, the only time when a solar eclipse can happen, the side of the moon turned to the sun is turned *from* us, while the side which is not affected by heating is turned towards us. This is why we do not see a dim red light of the moon during a solar eclipse.

It follows that Anaxagoras made an important contribution to the theory of both lunar and solar eclipses. In the case of lunar eclipses and lunar illumination in general, he advanced his own new theory. In the case of solar eclipses he removed the difficulty which stood in the way of the basically correct explanation already advanced by Thales.²⁶

²⁴ Αἰγυπτίους μὲν ἑβδομηκοστόδουν οἶμαι φάναι μόνον εἶναι τὴν σελήνην Ἀναξαγόραν δ' ὅση Πελοπόννησος. Görgemanns p. 135 argues that the testimony about the size of the moon in Anaxagoras was originally in Theophrastean doxography, too. This remains of course uncertain, but the authenticity of the testimony is not at all events to be doubted. We have two statements attested for Anaxagoras, that the moon is as large as the Peloponnese and that the sun is much larger than the Peloponnese. The combination of these two statements makes it clear that Anaxagoras arrived at both by using a solar eclipse with the path of totality crossing the Peloponnese. This idea was independently advanced by West p. 233 n. 1 and Sider (1973) p. 128f. Neither West nor Sider cite, however, the testimony from Plutarch. It should also be added that a sun larger than the Peloponnese and yet smaller than the earth is incompatible with the correct explanation of lunar eclipses.

²⁵ The discussion in *De fac. in orb. lun.* 929D–E (cf. 922A) strongly suggests that Plutarch knew only Posidonius' modification of Anaxagoras' theory. Although he has something to say about Anaxagoras' merits in elaborating a theory of lunar light (*Nic.* 23) and even quotes Anaxagoras' saying (cited in Section 2 above), it seems then that all this was second-hand knowledge. *Nic.* 23 has in fact a common source with *Cic. Rep.* 1.16.25 (another important text missing from DK) and *Quint.* 1.10.47f. It is characteristic that "the clearest and boldest" of all doctrines about lunar light, as *Nic.* 23 assesses that of Anaxagoras, is referred to in *De fac. in orb. lun.* only in most general terms. That Plutarch's information about Anaxagoras' theory of the moon was taken from secondary sources was already suggested by Hershbelle p. 144.

²⁶ It is characteristic that Anaxagoras is the first thinker after Thales for whom the correct explanation of solar eclipses is attested in an unambiguous way.

5

I hope that Anaxagoras' theory of the moon is now clarified and the affinity of a particular Peripatetic view with this theory has been shown. Peripatetic doxography appears in our case to be trustworthy, though one should understand what this doxography actually means. A troublesome contradiction which persisted a good hundred years is now solved, that between the sources indicating Anaxagoras' priority in the field, on the one hand, and Plutarch's quoting Parmenides, on the other. Plato, Theophrastus in Hippolytus, and Eudemus (if one accepts the emendation of Theon's text) do not say that Anaxagoras was the first to suggest that moonlight depends on the sun. Rather they refer to a particular theory advanced by Anaxagoras.

The question remains who was after all the first to introduce the general idea that the light of the moon depends on the sun. No source says that this was Parmenides.²⁷ The doxographic tradition asserts that this was Thales (11A17b DK). Because Thales left no written work, a degree of doubt is inevitable.²⁸ But one should not be surprised if the basically correct understanding of the nature of moonlight was achieved at the very beginning of Greek science. The discovery could have been provoked by a very natural question: Why is the light of the moon not hot, like that of the sun? One option was to assume that the moon is much farther from us than the sun. But Thales' theory of solar eclipses introduced the reverse order (11A3, A17a DK; *P.Oxy.* 3710, vol. 53 [1986] 97 Haslam), found also in Anaximander (12A11.5, A18 DK) and Heraclitus (22A1.10 DK). Then, it was not very difficult to notice a strong regularity in the mutual disposition of the sun and moon and draw the basically correct conclusions.

²⁷ This is not taken into account by Popper p. 12ff.

²⁸ In the main aspects, however, the ancient tradition about Thales' scientific achievement seems to be adequate: see Panchenko (1994a) and Panchenko (1996) p. 106–10, 122.

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16

On Eudemos Fr. 150 (Wehrli)

Gábor Betegh

I.

Fr. 150 of Eudemos, preserved in the *De principiis* of the 6th c. Neoplatonist philosopher Damascius,¹ has always been treated as one of our major sources for early theo-cosmogonies. Apart from some remarks on Homer and Hesiod, it contains precious information on an early version of the Orphic theogony, on Acusilaus, Epimenides, and Pherecydes of Syrus, and on the Babylonian, Persian and Phoenician theo-cosmogonies. For some of these texts, Eudemos is our only or main source. Accordingly, the fragment has proven vital to the reconstruction of these mythological narratives. These narratives, and correspondingly Eudemos' testimony on them, have become even more prominent as historians of Greek thought have tried to locate the passage from *mythos* to *logos* in these very texts. Thus the authors treated by Eudemos make their appearance in histories of Greek philosophy where they are treated not just as "theologians," as Aristotle had called them, but also as "The Forerunners of Philosophical Cosmogony."²

¹ Damascius' *De principiis* has been recently reedited by Westerink and translated into French by Combès (see Combès & Westerink).

² See, e.g., the first chapter of Kirk, Raven and Schofield.

If, however, we are interested in Eudemus' text itself, and not just in the individual entries it contains, our basic task is to say something about the nature and aims of Eudemus' work. By and large, there are two possible answers to the question concerning the nature of Eudemus' text. Either we regard fr. 150 as a part or a summary of an independent historical work, or we say that the text used by Damascius was a doxographical digression in a systematic work. Not surprisingly, both solutions have found proponents. We can conveniently sketch the alternative stances by referring to the two *Pauly-Wissowa* articles on Eudemus. In Martini's opinion it should be clear to any unbiased reader that the text comes from a "History of Theology."³ Furthermore, Martini concurs with Usener's suggestion that Eudemus' "History of Theology" is identical with *Τῶν περὶ τὸ θεῖον ἱστορίας* in six books, which we find in Diogenes Laertius' catalogue of Theophrastus' works.⁴

Wehrli, on the other hand, contends that the existence of an independent and comprehensive theological work cannot be proved. Consequently, he does not accept Usener's suggestion and finally opts for the alternative hypothesis according to which the text stems from a systematic work, most probably Eudemus' *Physics*.⁵ Wehrli's arguments consist in stating that (a) Aristotle occasionally refers to theogonical narratives in his doxographical overviews of the history of a given problem, and that (b) we can find historical digressions in the remaining fragments of Eudemus' *Physics*, as well.⁶ In what follows, I would like to consider fr. 150 with these points in mind. I shall first try to say something about the scope of Eudemus' work by examining the Damascian context. Then I shall consider the possible place of such a survey of the "theologians" within a Peripatetic context. Finally, I shall give my reasons for not finding Wehrli's hypothesis and arguments convincing.

II.

It seems to be important to start the discussion of fr. 150 by defining

³ Martini, col. 898.

⁴ Usener, 64. See also D.L. 5.48.

⁵ Wehrli 1968, col. 658.

⁶ Cf. also Wehrli 1955, 121–23 and 1983, 531. Understandably, Joseph Combès in his notes to the new edition of the *De principiis* did not feel it his task to tackle the question; he prudently speaks about "an unidentified work of Eudemus" (Combès & Westerink, 3:232).

its place and function in Damascius' *De principiis*,⁷ for the text of fr. 150 is not a direct quotation and thus, in principle, any kind of distortion is possible. Damascius might have reorganised the material collected by Eudemus, extracted just those parts which he found relevant for his own purposes, and made additions on the basis of other sources.

In the *De principiis*, Damascius elaborates his metaphysical system — which is in effect a revised version of Proclus' system — and painstakingly investigates the conceivable problems and paradoxes regarding the interrelation of different degrees of reality. From our viewpoint, it is important to note that in the *De principiis* Damascius concentrates exclusively on the highest levels of the late Neoplatonic ontological hierarchy, down to the level of the third member of the intelligible triad. Thus the four items considered are (i) "the ineffable" (ἀπόρρητον), (ii) "the one" (ἓν), (iii) the triad of the henadic principles, viz. "the one-all" (ἐν πάντα), "the all-one" (πάντα ἓν) and "the unified" (ἡνωμένον), and finally (iv) the triad of the intelligible, which consists of "the intelligible being," "the intelligible life" and "the intelligible intellect." The last item of the first triad, "the unified," can be further analyzed as consisting of the triad of "the intelligible." Therefore "the unified" and the triad of "the intelligible" can also be treated as identical. Damascius continues with the lower levels in his *Commentary on the Parmenides*.⁸

For Damascius, just as for Syrianus and Proclus, the full exposition of such a system must include not only a theological interpretation of the second half of Plato's *Parmenides* but also an allegorical reading of the *Chaldean Oracles* and the so-called *Orphic Rhapsodies*. The ultimate aim of these interpretations is to show that, the different modes of expression notwithstanding, Orpheus, Pythagoras, Plato and the *Chaldean Oracles* all held the very same doctrine.⁹ Toward this end, the Neoplatonic commentators try to establish a close correspondence, in fact, identity, between the different divine beings mentioned by Orpheus and the Chaldeans, the different hypotheses of the *Parmenides* and the different levels of the Neoplatonic ontology. It is just as impor-

⁷ The question is briefly and unsatisfyingly discussed by Wehrli 1955, 122.

⁸ On the relationship between the *De principiis* and the *Commentary on the Parmenides*, see Westerink, 9–10 and Combès & Westerink (1:LVIf.).

⁹ The *Suda* attributes both to Syrianus and Proclus a work with the title *The Agreement between Orpheus, Pythagoras, Plato and the Chaldean Oracles* (Συμφωνία Ὀρφεώς, Πυθαγόρου, Πλάτωνος πρὸς τὰ Λόγια). On the history of this interpretative tradition see Brisson (1987, 43–103 and 1991).

tant for them to prove that Plato is a theologian as to show that the *Orphic Rhapsodies* and the *Chaldean Oracles* propound a complex metaphysics.

Although Orpheus, Pythagoras, Plato and the *Chaldean Oracles* are the main points of reference, the *diadochoi* reassure us on occasion that Homer and Hesiod put forward the same view.¹⁰ From this position, it is just a small step to the ultimate claim that *all* the theologians held the same doctrine. We can find this conviction expressed in some other Neoplatonic texts as well,¹¹ but it is apparently Damascius who actually undertakes a systematic and wide-ranging survey and analysis of the different theogonical traditions near the end of his *De principiis*.

Within this project, there is first a lengthy discussion of the *Chaldean Oracles* (3:108.16ff. Combès & Westerink = 1:285ff. Ruelle), at the end of which Damascius promises that on another occasion he will provide a more elaborate interpretation of the wisdom of the Chaldean sages.¹² He then continues with the following words:

... let us now, within due limits, inquire what the other theologians have handed down *about the intelligible diacosmos*, whether we can gain some even greater and the greatest possible reverential awe from them of this transcendent union. (3:159.12ff. Combès & Westerink = 1:315ff. Ruelle, *my italics*)

Particularly significant is Damascius' explicit assertion that, in accordance with the general scope of the *De principiis*, his project is restricted to the realm of the intelligible. Let us first see in what way this restriction affects his use of the sources.

¹⁰ Presumably this is what was systematically elaborated in such works as *On the Gods in Homer*, attributed by the *Suda* both to Syrianus and Proclus. See also, e.g., Proclus, *In Tim.* 316.4–11.

¹¹ Proclus loc. cit. "So we have demonstrated that the whole of the Greek theology (σύμπασαν τὴν Ἑλληνικὴν θεολογίαν) attributes to Zeus the creation of the whole etc." We also learn from the *Suda* (s.v. Heraiscus) that the Egyptian Asclepiades, Heraiscus' brother, outstandingly versed in Egyptian theology, also wrote about the agreement of all theologies (τῶν θεολογιῶν ἀπασῶν τὴν συμφωνίαν). It is noteworthy that on the one hand this entry in the *Suda* is based on Damascius' *De Vita Isidori* and that Damascius' source for the Egyptian theologies in the *De principiis* is none other than Asclepiades and his brother.

¹² Cf. Damascius, *In Parm.* 2.9.21f.; 11.11ff.; 132 Ruelle.

For the realization of his program he uses a considerable range of different sources. Apart from the *Orphic Rhapsodies*, which was in all probability easily available in Neoplatonic circles, he adduces material from Hieronymus and Hellanicus, Eudemus, Mochus, Asclepiades and Heraiscus. Damascius takes the different mythological genealogies reported by these authors one after the other, and provides them with an allegorical, metaphysical running commentary.¹³ I have tried to schematise the outcome of the Damascian interpretation in a diagram. I hope to be able to explain a few peculiarities of fr. 150 by pointing out some regularities in Damascius' interpretative method by the help of this table.¹⁴

Damascius first turns to the *Orphic Rhapsodies* and recapitulates Syrianus' and Proclus' interpretation. Damascius makes it clear that on some points he cannot accept the interpretation of his masters. He next outlines a less common version of the Orphic theogony for which he names a certain Hieronymus and a certain Hellanicus as his source. Neither we nor Damascius know anything further about Hieronymus and Hellanicus.¹⁵ Moreover, while he is giving his interpretation of the Hieronymus–Hellanicus version of the narrative, he sets out his own reading of the *Rhapsodies*. The only apparent advantage of Damascius' reading of the *Rhapsodies* over that of Syrianus and Proclus is that it is in agreement with the interpretation he offers of the Hieronymus–Hellanicus narrative: for both narratives, his reading allots Time, Aether and Chaos the same respective positions (see Diagram on pp. 342–43). From this we can infer that Damascius finds it important to harmonize the reading of the different versions of the Orphic theogony.

¹³ Damascius' use of the mythological material is summarily treated by Strömberg 180ff. See also Holwerda (293ff.) on the Orphic theogonies. I find Holwerda more instructive.

¹⁴ Admittedly, in the case of such a complex system, a diagram is a blunt tool. For one, the fact that the third level of the first triad (the unified) is identified with the intelligible renders the representation problematic; this I indicate with a divided line. Corresponding to this identification, the unified might or might not be allegorised with the help of a separate divinity.

¹⁵ There have been some attempts to identify these authors, or at least one of them, as Damascius himself alludes to the possibility that the two names actually refer to the same person. Recently, West (176ff.) suggested an Egyptian Hieronymus mentioned by Flavius Josephus (*Ant. Iud.* 1.94). In the present context, more interesting, albeit just as conjectural and even less likely, is Lobeck's hypothesis (340), that the reference is to Hieronymus of Rhodes, the third century Peripatetic from the school founded by Eudemus.

Dam. *De princ.*

	ORPHICA				OTHER GREEK		
	<i>Orphic Rhapsodies</i>		Orpheus	Orpheus	Homer	Hesiod	Acusilaus
	Syrianus & Proclus	(III, 161. 14ff.)	Hieronymus & Hellanicus	Eudemus			
ineffable							
one	Time	Ø	Ø	Ø			Chaos
one-all	Aether	Ø	Water	Ø			Erebos
all-one	Chaos	Ø	Earth	Ø		Chaos	Night
unified	Egg	Time	Time	Ø			
intelligible being		Aether	Aether	Ø		Chaos/ Earth	Aether
intelligible life	?	Chaos	Chaos	Ø		Earth/ Tartarus	Eros
intelligible intellect	Egg/white tunic/cloud	(Eros)	Erebos	Ø		(Eros)	Metis
intelligible- intellective	Phanes		Egg	Ø			(continued in E.)
	Erikepaios		male & female	Ø			
	Metis		Protogonos	Ø			
intellective	[Night 1]			Night	Night vs. Okeanus- Tethys		
	[Night 2]						
	[Night 3]						

Having discussed the *Rhapsodies* and the Hieronymus-Hellanicus narrative, Damascius goes on to consider Eudemus' work, starting with Eudemus' version of the Orphic theogony. Damascius is extremely brief in this instance:

The theology described in the Peripatetic Eudemus as being that of Orpheus is silent about the entire realm of the intelligible, for it is completely ineffable and unknowable by the method of exposition and narration: it made its start from Night, from whom Homer too made his start ... (3:162.19ff. Combès & Westerink = 1:319 Ruelle)

So all that we learn about this version is that it started with Night.¹⁶ For students of early Orphism this brevity is extremely regrettable. I do not think, however, that we should hold Eudemus responsible for it; we have every reason to suppose that the account continued in Eudemus' work, but it was not taken over by Damascius.¹⁷ For, according to Damascius, Eudemus' version of the Orphic theogony does not speak at all about the realm of the intelligible, but starts only with the lower ontological levels, and these lower levels already fall outside the scope of Damascius' present inquiry.

But how can one know, it might be objected, that Night, this primeval divinity, does not represent a higher degree of reality in the version recorded by Eudemus? I think that Damascius would respond by pointing out that if Night represented a higher ontological level, this version would conflict with other versions of the Orphic theogony, and this should be avoided. On the other hand, if we consider that in the standard version, the *Orphic Rhapsodies*, Night is the daughter of Phanes, then her natural place must be the first level after the one occupied by Phanes. But according to the interpretation accepted by Damascius, the different denominations of Phanes (Erikepaios, Metis and Protogonos) occupy the lowest levels of the intelligible, and, therefore, Night's position must already be below the intelligible. Thus, if Night is the first divinity in Eudemus' account, we have to conclude that this version of the Orphic theogony does not say anything about the intelligible, but starts with the intellective. And as Damascius' present work is only

¹⁶ In *Metaph.* 12.6, 1071b26–27, Aristotle says that some of the “theologians” generate the world from Night.

¹⁷ West (116ff.) supposes that, although there is no mention of Night there, we can find the subsequent stages of the genealogy in *Timaeus* 40D6ff. For a criticism, see Brisson 1985, 402ff.

concerned with the realm of the intelligible, he had no need to quote the remainder of the genealogy from Eudemus.¹⁸

That Damascius' interest in the early theogonies is conditioned by the scope of his treatise becomes even more apparent in the cases of Acusilaus, Epimenides and Pherecydes. When in the interpretation of these authors Damascius reaches the level of the third component of the second triad, the intelligible intellect, he stops his own exposition of the theogony but adds at the same time that there are more generations adduced in his source.¹⁹ He continues the allegorical reading beyond the triad of the intelligible only in one case, when he gives a second, alternative interpretation of the Phoenician theology according to Mochus: he says that if we choose this second, less probable interpretation, the god Khousorus would represent the first order after the intelligible. Yet, in this case too, he is not interested in the lower levels as such, but wants to point out the differences between the two alternative interpretations. The one real exception to this restrictive approach is the Babylonian theogony, which we can, by the way, identify with the *Enuma Elish*. In this case Damascius does name a few more gods, without determining their place in his ontological scheme. Possibly, this can be explained by the fact that this theogony was little known and Damascius might have been interested in recording more of it. Yet, notably, the allegorical interpretation does not go beyond the level of the intelligible in this case either.²⁰

¹⁸ This move becomes even more meaningful and legitimate if the genealogy after Night in Eudemus' version corresponded with the account of the *Orphic Rhapsodies*. Note also that Night is placed below the level of the intelligible in the respective interpretations of Syrianus and Proclus.

¹⁹ "After these, from the same ones, he [sc. Acusilaus] introduces a great number of other gods, according to Eudemus' inquiries." (3:164.6–8 Combès & Westerink = 1:320 Ruelle); at the end of the Epimenides entry: "... from which again another generation proceeded." (3:162.16 Combès & Westerink = 1:320 Ruelle); for Pherecydes: "... from which [sc. fire, *pneuma*, water], after they were distributed in five nooks, arose another numerous generation of gods, called the five-nooks generation, and this is probably the same as to say the five-cosmos [generation]. There will probably be another occasion to speak about these." (3:164.21ff. Combès & Westerink = 1:321 Ruelle; trans. Schibli).

²⁰ We find another account of the *Enuma Elish* in Eusebius, who quotes Alexander Polyhistor, who, in turn, takes his information from the first book of Berossus' *Babylonika*. It is noteworthy, however, that in the judgment of the assyrologists, Eudemus' report is far more precise. Cf., e.g., Bottéro & Kramer, 676ff.

It seems highly probable, then, that Damascius took over from his sources just as much as was necessary for his immediate purpose. He considered, in conformity with his announced program, only so many divinities from each theogony as he could allegorically interpret down to the third element of the second triad. We have thus every reason to suppose that Eudemus continued the series of divine generations beyond the first few deities set out by Damascius.

Furthermore, we also have to consider whether Eudemus' work could have included more theogonies than the seven or eight²¹ Damascius mentions. There is only one sentence that might help us in this respect. Having discussed Pherecydes, Damascius closes the examination of the Greek theogonies with the following words:

Let such and so many hypotheses expressed by the Greek myths now be taken over by us, although there are many others. (3:165.3–5 Combès & Westerink = 1:321 Ruelle)

I do not think this sentence is conclusive regarding our problem. It can either mean that this was all Damascius could extract from Eudemus, even though he was aware of the fact that Eudemus' discussion is incomplete; or rather that, although there are more theogonies in Eudemus and elsewhere, Damascius thought the ones he had already discussed would suffice. I would, nevertheless, like to draw attention to a salient omission. Even if we disregard such shadowy figures as Melampous, Linus and Abaris, we would certainly expect such a review of early mythical theogonies to consider Musaeus. Who is responsible for this omission, Eudemus or Damascius?

Now Plato, Aristotle and Theophrastus do refer to Musaeus (Pl. *Resp.* 2.363C; Arist. *Hist. anim.* 6.6 563a18; Theophr. *H. plant.* 9.19.2), though these references are not necessarily to a theogonic poem: they might refer to verses in an anthology of oracular answers. Our earliest explicit source for Musaeus' theogonic poem, probably identical with the *Eumolpia*, is Eratosthenes (2B8 DK). The only reason for West to fix the date of the *Eumolpia* as late as the second half of the fourth century, is that Musaeus does not appear in Eudemus fr. 150.²² Yet the fact

²¹Eight, if we count the Egyptian theogony, for Damascius makes it clear that Eudemus had also spoken about the Egyptian theogony, although not as "clearly" as the Neoplatonic Asclepiades and Heraiscus did (3:167.1 Combès & Westerink = 1:323 Ruelle).

²²West, 43.

that Musaeus does not appear in Damascius cannot prove that he could not have been treated by Eudemus. Furthermore, Musaeus' theogony is also discussed in the doxographical part of the *De pietate* of Philodemus, whose main source, very probably, was Eudemus.²³ Similarly, Hippias mentioned Musaeus together with Orpheus, Hesiod and Homer in the introductory sentence of his *Synagoge*, and Chrysippus interpreted him allegorically (Hippias 86B6 DK; Chrysippus *SVF* 2.316.12, 16). It would, then, be surprising indeed if Eudemus had ignored him. On the other hand, Musaeus is never treated in the extant works of the Neoplatonics as the author of a theogony. He appears in Proclus' commentaries, but only as the mythical son of the Moon and the father of initiatory rites.²⁴ Considering this, it seems to me more likely that Musaeus did figure in Eudemus but was left out by Damascius, in keeping with Neoplatonic practice.

Concluding this inquiry concerning the scope of Eudemus' work I contend that it must have been considerably more extensive than what we find in Damascius. It probably contained more theogonies than Damascius mentions and it surely enumerated more generations from the individual theogonies.

Let us now turn to a second question concerning Damascius' use of his sources. How far might he have distorted the accounts he found in his sources? This question amounts to asking how violent his allegorizing method was. First we have to note that, basically, his interpretative strategy consisted in transforming the chronological, genealogical successions into an ontological hierarchy: temporal priority in the genealogies is transformed into ontological priority.²⁵ Now this method, applied to Damascius' ontological hierarchy, seems to be rather open in the sense that it could assimilate almost any construction.²⁶ Damascius assumes fundamental doctrinal identity, yet accepts differences. If we consider, for instance, the top levels of the hierarchy, first we note with

²³ So Henrichs, 78 n. 28; with the addition that "Damascius has written out Eudemus more fully than Philodemus or his source," as, e.g., the respective entries on Epimenides show (79 n. 32). Cf. also, Kirk, Raven and Schofield, 19 n. 2.

²⁴ Cf. *In Tim.* 1.111.29; 1.165.20. The fact that Musaeus had sometimes been identified with Moses could also render his interpretation problematic for the pagan Neoplatonics. Cf., e.g., Numenius fr. 9 (Des Places) and Artapanus *FGrHist* 726 F3.3. I am grateful to László Bene for this point.

²⁵ The view according to which there is a correspondence between an ontological hierarchy and the temporal structure of a narrative is at least as old as the *Timaeus*.

²⁶ So also Holwerda.

some relief that, at least according to Damascius' interpretation, none of the theologians dared to speak about the unspeakable first principle. Thereafter the theologians had a choice. Either they started with the One, or they could "honour it with silence"²⁷ and begin with the first two henadic principles, the one-all and the all-one. It means that Damascius could place those who started their story with *one* divinity in the first group, while those who had spoken of a primordial *pair* could go into the second.

But what about someone like Pherecydes who had *three* gods right at the beginning? This does not trouble Damascius:

Pherecydes of Syros said that Zas has always existed and Chronos and Chthonia, the three first principles, I mean the one before the two, and the two after the one ... (3:164.17–19 Combès & Westerink = 1:321 Ruelle, trans. Schibli, modified)

This passage shows that Damascius was prepared to let the original account speak, even if it apparently ran counter to his own tenets.²⁸ On one occasion, however, Damascius does disagree with his source. Having established that Eudemus' version of the Orphic theogony started with Night, he goes on to discuss Homer:

... it [sc. the theogony ascribed to Orpheus] made its start from Night, from whom also Homer begins, although he did not make his genealogy continuous. For we should not believe Eudemus when he says that [Homer] begins from Okeanos and Tethys. For he too manifestly knows²⁹ that Night is the greatest divinity, so that even Zeus feels awe before her:

"for he feared to do what would be hateful for swift Night" (*Il.* 14.261)

But let also Homer himself begin from Night. (3:162.22ff. Combès & Westerink = 1:319 Ruelle)

Presumably, Damascius wanted to emphasize the preeminence of Night by this Homeric passage as well. Incidentally, this passage shows that the basic method of allegory works in both ways. Temporal priority merits a higher place in the hierarchy, whereas from the high status of

²⁷ Cf. the entry on Epimenides, 3:164.9ff. Combès & Westerink = 1.320 Ruelle.

²⁸ Plotinus, too, seems to say that Pherecydes had *one* ultimate principle (5.1.27–32). This assumption can be explained by Pherecydes' alleged relation to Pythagoras. Cf. Schibli, 15 n. 5.

²⁹ The wording φαίεται + participle is stronger than Combès' "paraît avoir su."

Night we can infer that she must have come first in the genealogy. Anyway, what is important for us is that even though Damascius disagrees, he quotes the opinion of Eudemus.

But the view Damascius attributes to Eudemus on Homer is of further interest for us. This is the point where we shall quit Damascius and turn to the Aristotelian context.

III.

The interpretation of Homer which Damascius ascribes to Eudemus is not an obvious one,³⁰ but it soon became a commonplace. It is based on two otherwise quite isolated passages in *Iliad* 14.

Okeanos, origin (γένεσις) of the gods, and mother Tethys (*Il.* 14.201)

and

Any other of the everlasting gods I would easily send to sleep, even the stream of river Okeanos, who is the origin of all. (*Il.* 14.244–6; cf. Pl. *Tht.* 160D–E, 179E, 180C–D)

The view according to which Homer originated the world from the two water-gods appears in our extant sources first in two dialogues of Plato (*Crat.* 402A–C and *Tht.* 152D–E), and then in Aristotle's *Metaphysics* 1.3 983b20–984a5. Plato relates the Heraclitean doctrine of flux to Homer, whereas Aristotle discusses the relationship between the doctrine attributed to Homer and Thales' first principle. As is well known, Bruno Snell has demonstrated that Aristotle's account is not dependent on Plato, but that both philosophers must have used a common source, the *Synagoge* of Hippias.³¹ Joachim Classen, Andreas Patzer and Jaap Mansfeld, elaborating on Snell's results, have convincingly shown that Hippias' method consisted in grouping different authors under different headings on the basis of the alleged identity of their tenets.³² Furthermore, Snell argued that this specific interpretation of *Il.* 14.201 can help us to identify the material taken over from Hippias.

³⁰ Kirk, Raven and Schofield (14) argue that these verses did not necessarily mean chronological priority.

³¹ Snell, 119ff.

³² Classen, 175ff.; Patzer; Mansfeld (1983, 1985a and 1986). Cf. also Kienle, 39, 43.

Can we say, then, that Eudemus' source was Hippias? True, Snell's discovery, in itself, cannot guarantee that Eudemus had borrowed his material directly from Hippias. He could just as well have derived it from Aristotle's *Metaphysics*, or, for that matter, from Plato. I would like to present some considerations that would nevertheless strengthen the first option.³³

First, if we consider the scope of Hippias' work, it turns out to be remarkably close to that of Eudemus. We have the introductory sentence of the *Synagoge* as preserved by Clement of Alexandria:

... some of these things have probably been said by Orpheus, some by Musaeus, briefly here and there, some by Hesiod, some by Homer, some by other poets, some in the prose works, some by Greeks and some by Barbarians. From all these, I have collected what are the most important and what belongs together to compose this new and many-sided work. (Hippias 86B6 DK = Clem. Alex. *Strom.* 6.2.15)

A prominent feature of this program and an important parallel to Eudemus' survey, is the attention paid to the non-Greek authors. Furthermore, Classen, Mansfeld and Patzer have demonstrated that apart from the poets mentioned by name in the prooemium, and some major Presocratics, Hippias must have also dealt with Acusilaus³⁴ and probably Pherecydes,³⁵ who figure on Eudemus' list too.

It is just as important to note, moreover, that there is some independent evidence showing that Eudemus used Hippias' historical accounts. On the basis of fr. 133ff. (Wehrli), stemming from Proclus' *Commentary on the First Book of Euclid's Elements*, it seems likely that in his work on (the history of) geometry Eudemus had taken at least some of his information concerning the pre-Platonic period from Hippias.³⁶

Even if the evidence is not enough to prove without doubt that Eudemus derived his material from Hippias, the *Synagoge*, and especially its treatment by Aristotle, is of further interest to us as we return to Wehrli's hypothesis concerning the nature of Eudemus' work. For

³³ In an addition to the original paper, Snell (128) states that "Eudem fr. 150 W. übernimmt aus Hippias die Meinung, daß Homer an den Anfang aller Genealogie den Okeanos und die Tethys gestellt hätte." I am inclined to think Snell was right, but the view needs arguing.

³⁴ From Phaedrus' speech in *Symp.* 178A–B.

³⁵ Pl. *Soph.* 242C8. Cf. Mansfeld 1986, 25.

³⁶ Cf. Snell, 128, quoted in n. 33 above; Kerferd, 48

Jaap Mansfeld, in his discussion on Aristotle's use of Hippias, has corrected Snell on an important point. Mansfeld has made it clear that Snell "failed to take into account that Aristotle's main point is polemical."³⁷ As a matter of fact, Aristotle does not accept Hippias' quasi-allegorical method with the help of which Hippias finds the tenets of the Presocratic philosophers anticipated in the theologising authors. When in the third chapter of *Metaphysics* 1 Aristotle discusses Thales' view of the material principle, he declares that we cannot decide whether Homer and Thales did or did not hold the same doctrine about the origin of the world. Even though Thales was still very far from the full truth, his statements are philosophically meaningful, whereas we cannot give a scientifically responsible interpretation of Homer's poetical utterances. This is exactly the reason why we can say that Thales was the first philosopher.³⁸

It is worthwhile to consider very briefly some other passages where Aristotle mentions the "theologians."³⁹ In *Metaph.* 14.4 1091a29ff., he examines the relationship between the elements and principles on the one hand and the good and the beautiful on the other. On this point, the utterances of the theologians might, with some hesitation, be compared to genuinely philosophical stances.⁴⁰ If we allow that the figure of Zeus can be taken as in some sense analogous to the philosophical conception of the principle of good, then the "theologians" side with those philosophers who maintain that the good has no temporal priority but appears at a later stage in the history of the world. Yet, Aristotle hastens to add that this position attributable to the "theologians" is not the result of philosophical consideration, but stems from the fact that the mythological narratives are traditionally about the succession of divine rulers.⁴¹ Thus, the demarcation between the two modes of expression is further reaffirmed. That is also why Aristotle can single out Pherecydes and the Magi and claim that they "combine the two char-

³⁷ Mansfeld 1983, 47.

³⁸ Cf. Mansfeld 1985a and 1985b, 47ff.

³⁹ For a more complete discussion of Aristotle's use of the "theologians," see now Palmer.

⁴⁰ παρὰ μὲν γὰρ τῶν θεολόγων ἔοικεν ὁμολογεῖσθαι τῶν νῦν τισὶν κτλ. See also *Metaph.* 12.10 1075b24ff.

⁴¹ Cf. Annas ad loc.; Mansfeld 1985b, 53.

acters” and do not use a mythical mode of presentation throughout: they make the supreme god part of the first generation of divine beings.⁴²

In *Metaph.* 3.4 1000a9ff. Aristotle raises problems concerning the principles of perishable and imperishable beings. Hesiod and the theologians are severely criticized here for maintaining that those who have tasted nectar and ambrosia become immortal, while those who have not cannot avoid destruction. It is noteworthy that Aristotle explicitly says here that “it is not worthwhile” to consider seriously those who have expressed themselves in a mythical form.

Mythical narratives receive the most sympathetic treatment in *Metaph.* 12.8 1074a38ff. Here Aristotle combines his assessment of the mythological authors with his doctrine on the cyclical development of the arts and sciences. “Our forefathers” have handed down to us the correct view that the first substances are gods. However, at a later stage, anthropomorphism and mythical expression have been added for pragmatic purposes. The “theologians” are not mentioned as such in this passage, but they are probably the ones who subsequently clothed the original insight in mythological garment. The philosophically meaningful idea is certainly not theirs, and what they did at best was to help its propagation. More important, the closing sentence of the passage sets an important restriction on the endoxic value of these narratives: “only thus far, then, is the opinion of our ancestors and our earliest predecessors clear to us.” In other words, Aristotle acknowledges a core of truth in the myths, yet asserts that apart from the basic recognition that the first substances are gods we can extract nothing else from these narratives in terms of philosophy.⁴³

In some cases the views of the “theologians” appear in the discussion of a specific problem. Here too, an idea expressed in a mythical narrative might be treated as one of the *endoxa* to be examined in a preliminary discussion.⁴⁴ We find such a passage in *Meteorology* 2.1 353a35ff.,

⁴² The passage is discussed by Schibli (18 n. 11).

⁴³ For the cosmological interpretation of early theology, see also *De caelo* 1.3 270b4ff. and 2.1 284a2ff.

⁴⁴ The use of myths as part of the endoxic method is discussed by Johansen, taking the example of Aristotle’s treatment of the Atlas myth in *Movement of Animals* 3 699a27–32. This case is one of the rare exceptions where Aristotle, at least initially, says that the mythical view is κατὰ λόγον—but for this we should first allegorise Atlas as the diameter of the whole. However, it soon becomes clear that the Atlas myth, even on this charitable interpretation, contains presuppositions which are unacceptable for Aristotle.

where Aristotle starts to consider the different views pronounced on the origin of the sea. Aristotle begins with a brief mention of “those ancients who concerned themselves with theology” and who said that the seas have springs, after which he turns to those who were “wiser in human knowledge.”

From the above passages we can draw some important conclusions regarding fr. 150 of Eudemos.⁴⁵ First, that the poets and prose writers discussed by Eudemos constitute a well defined, self-consistent group for Aristotle: they are the “theologians,” those ancient authors who concerned themselves with mythical narratives about the gods and their genealogy. Although Aristotle acknowledges that they could also speak about the physical world, this group is clearly distinguished from the philosophers. Eudemos’ text, as seems obvious from Damascius, discussed this group of theologians, and it is highly improbable that Eudemos ignored the Aristotelian demarcation in his survey and treated the theologians without distinguishing them from the *physikoi* and other philosophers.

Moreover, it should be clear that Eudemos’ text could not have served as a preliminary historical survey for the discussion of a point in a systematic work in philosophy, unless he seriously disagreed with his master’s tenet. We may consider, on the basis of the Aristotelian passages, those problems in the discussion of which the views of the theologians, in spite of their lack of clarity, can be relevant.

Aristotle mentions the “theologians” in connection with the material cause.⁴⁶ Even if we suppose that Eudemos disregarded what Aristotle had objected to Hippias’ method in *Metaph.* 1.3, it would, in such a context, make absolutely no sense to follow, as Eudemos did, the succession of divine generations. If we speak about the ἀρχαί, we would consider the *first* gods of the theologians—as indeed Hippias did—but not their succession up to, say, the seventh generation.

Second, the views of the theologians could also be considered in the discussion of the first substances or heavenly bodies. As we have seen, Aristotle allows that the mythological narratives transmit a basic truth when they speak of the first substances as gods. On this very point they

⁴⁵ Apart from *Metaph.* 983b1ff., Wehrli (1969, 122) refers only to fragments 6ff. of *De philosophia*. I do not think that the context of *De phil.*, as far as we can reconstruct it, can help us in deciding whether Eudemos’ fr. 150 could or could not come from a work on physics.

⁴⁶ Cf. Wehrli 1955 ad fr. 89.

are actually proved to be wiser than the *physikoi*. But here too, Eudemus' accounts are irrelevant. For he records precisely what, for Aristotle, was a later addition that obscured the original intuition: the mythical stories about the succession of anthropomorphic gods.

Third, we have the discussion of a particular point, such as the nature and origin of the sea. Yet I cannot imagine that Eudemus' survey, which takes the theologians one after the other and tells their stories from the beginning, could be relevant to the consideration of such a particular problem. Eudemus' material seems best suited to a systematic or allegorical discussion of a succession of items more or less dependent on each other, like the Neoplatonic metaphysics. So I cannot follow Wehrli when he argues, on the basis that fragments of Eudemus' *Physics* also contain historical digressions, that fr. 150 could be part of a work on physics.⁴⁷ Indeed, it tells against Wehrli that these digressions in the *Physics* do not mention the "theologians" at all.⁴⁸

I conclude, then, that Eudemus' text was not a digression in a systematic work intended to review *endoxa* on a particular point under discussion, for, as I have tried to show, there is no such point for which the material as presented by Eudemus could be relevant. Eudemus' work was more probably a synoptical collection of the genealogical narratives of the "theologians."⁴⁹ Obviously, this does not exclude the pos-

⁴⁷ Wehrli 1955, 122.

⁴⁸ The only possible exception is fr. 89, an isolated sentence in D.L. 1.9. It seems likely to me, however, that when Diogenes says that ταῦτα καὶ; Εὐδήμος ὁ Ῥόδιος ἱστορεῖ, he does not refer to the previous sentence which contains an interesting detail mentioned in passing from Theopompus' *Philippica*, but he continues the list of those (Aristotle, Hermippus, Eudoxus and Theopompus) who can testify that the first two gods in the theogony of the Magi were Oromasdes and Areimanius. In this case Diogenes would simply be referring to Eudemus' account of the Magi that we find in fr. 150.

⁴⁹ It is difficult to see how the material was originally organized in Eudemus, as Damascius could shift the entries. For instance, he could put Orpheus first because he had just finished with the *Rhapsodies* and the Hieronymus-Hellanicus version and wanted to group the different accounts on the Orphic theogony together. Also, Homer might have been mentioned immediately after Orpheus, because Damascius claimed, *pace* Eudemus, that Night was the first divinity also in Homer. On the whole, it is possible, as David Runia has suggested to me, that Eudemus organised the entries according to the number of the first divinities. However, within the group of the non-Greek theologians, where Damascius had no apparent reason to change the original order, the Babylonians have *two* first gods, the Magi *one*, and the Sidonians *three*. But it is also possible, as Leonid Zhmud has argued, that the entries were arranged chronologically. Here, the problem is that we can only guess what relative chronology Eudemus would establish for Acusilaus, Epimenides and Pherecydes.

sibility that the data gathered by Eudemus at a later stage could have been used in systematic discussions of different problems. On the contrary, this might well have been the ultimate purpose of such a collection. I would be most inclined to think of an opusculum for school use, a data-base, as it were.⁵⁰

Once this is accepted, fr. 150 of Eudemus displays another interest. It shows the application and institutionalization of the Aristotelian distinction between “theologians” and philosophers. This distinction is so evident for us that it tends to obscure the originality of Eudemus’ undertaking. Yet we have to recognise that this demarcation was not usually observed outside the Peripatos.⁵¹ Hippias’ view, according to which Homer and Thales, Hesiod and Parmenides held the same doctrine, or at least can be treated on common footing, was more appealing for the Greeks. After all, that is what the history of allegorical interpretation from the early Stoics to the late Neoplatonics is all about.⁵²

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⁵⁰ I would like to stress that this conclusion is not tantamount to accepting Usener’s hypothesis regarding the identification of Eudemus’ work.

⁵¹ It is noteworthy that Philodemus, drawing on Eudemus, also treated the cosmogonies of the ‘theologians’ and those of the Presocratics separately. Cf. Henrichs, 78 n. 28 and 80f.

⁵² I would like to thank David Runia, my respondent at the conference in Budapest, Leonid Zhmud, David Sedley, Reviel Netz, Gregory Bucher and Gretchen Reydams-Schils for their attentive reading and very helpful comments.

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